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Ex Parte 679

The Honorable Anne K Quinlan
Acting Secretary
Surface Transportation Board
395 E Street, N.W
Washington, D C 20423

Re: Petition of the Association of American Railroads to Institute a Rulemaking Proceeding to Adopt a Replacement Cost Methodology to Determine Railroad Revenue Adequacy

Dear Secretary Quinlan

Enclosed for filing are an original and 15 copies of a petition by the Association of American Railroads requesting that the Board institute a rulemaking proceeding to adopt a replacement cost methodology to determine railroad revenue adequacy The petition is supported by verified statements by (1) Professor Joseph P Kalt and John C Klick and (2) Michael R Baranowski We have included an original and 15 copies of these verified statements as well Please note that the Kalt/Klick verified statement contains color pages

In addition to the paper copies, we are submitting three CDs containing electronic versions of the petition and the supporting verified statements In a separate envelope, marked "CONFIDENTIAL MATERIALS SUBJECT TO REQUEST FOR A PROTECTIVE ORDER," we have included three CDs containing confidential workpapers supporting Mr Baranowski's verified statement for which confidential treatment is requested In accordance with the draft protective order submitted with the filing, these disks are marked "CONFIDENTIAL – UNDER SEAL"

We also enclose an original and 15 copies of a motion for protective order with a draft protective order attached Electronic versions of the motion and draft order are contained on the public CD included with the petition filing

Please direct any questions concerning this filing to the undersigned

Sincerely yours,

Samuel M Sipe, Jr
Counsel for Association of American
Railroads

cc: Louis P Warchot

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BEFORE THE
SURFACE TRANSPORTATION BOARD

Ex Parte 679

PETITION OF THE ASSOCIATION OF AMERICAN RAILROADS TO INSTITUTE A RULEMAKING PROCEEDING TO ADOPT A REPLACEMENT COST METHODOLOGY TO DETERMINE RAILROAD REVENUE ADEQUACY

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BEFORE THE
SURFACE TRANSPORTATION BOARD

PETITION OF THE ASSOCIATION OF AMERICAN RAILROADS TO INSTITUTE A RULEMAKING PROCEEDING TO ADOPT A REPLACEMENT COST METHODOLOGY TO DETERMINE RAILROAD REVENUE ADEQUACY

Pursuant to 49 C.F.R §1110 2(b), the Association of American Railroads ("AAR") hereby requests that the Board initiate a rulemaking proceeding and propose the adoption of a replacement cost methodology to value railroad assets for purposes of the Board's annual revenue adequacy determinations required under 49 U S C §10704(a) Under AAR's proposal, the Board's existing standard for determining revenue adequacy – whether a railroad is earning a return on investment equal to the railroad industry cost of capital – would remain in effect, and the Board would use the cost of capital determined in accordance with the recently adopted CAPM standards in its revenue adequacy determination [1]

The rationale for adopting AAR's replacement cost methodology is set out in this Petition and the supporting verified statements Professor Joseph P Kalt and John C Klick explain that AAR's proposed replacement cost methodology implements competitive market principles in the context of revenue adequacy determinations Michael R Baranowski describes in detail how the proposed methodology can be implemented in annual revenue adequacy proceedings Section IV of this Petition presents the essential components of AAR's proposal in summary format

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[1] *See Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, Ex Parte No 664 (served Jan 17, 2008). The Board has indicated that the CAPM standard may be used in the future in conjunction with a multi-stage discounted cash flow model to determine the cost of equity capital *See Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital*, Ex Parte No 664 (Sub-No 1) (served Feb. 11, 2008)

This Petition and the testimony supporting it demonstrate that the replacement cost methodology proposed by AAR is economically superior to the current methodology based on net book value, can feasibly be implemented in annual revenue adequacy proceedings, and addresses the problems that have kept the ICC and the Board from previously adopting a replacement cost methodology

AAR is a trade association representing the interests of North America's major freight railroads AAR participated actively in prior proceedings before the Board's predecessor, the Interstate Commerce Commission ("ICC"), regarding the methodology to be used in assessing the adequacy of railroad revenues under 49 U S C §10704 AAR has also participated actively in the Board's ongoing proceedings relating to the methodology to be used in calculating the railroad industry's cost of capital, an important element in the Board's assessment of revenue adequacy

AAR and its members have a vital interest in having in place a method for determining revenue adequacy that results in accurate estimates Accordingly, AAR urges the Board promptly to initiate a rulemaking proceeding to consider adopting the replacement cost methodology proposed herein

INTRODUCTION

Ever since the ICC adopted the current revenue adequacy standard in 1981, the agency has recognized that use of replacement cost is the correct approach to asset valuation However, the ICC declined to adopt a replacement cost standard for valuing existing railroad assets because it could not identify a feasible method of estimating replacement costs for use in revenue adequacy proceedings

With its recent adoption of Simplified Stand-Alone Cost Procedures ("SSAC") for use in medium sized rate cases, the Board has now concluded that it is feasible to use estimates of replacement costs in regulatory proceedings *See Simplified Standards for Rail Rate Cases*, Ex Parte No 646 (Sub-No 1) (served September 5, 2007) ("*Simplified Standards*") The SSAC test uses replacement values that have already been determined by the Board in the context of contested Full-SAC proceedings The SSAC methodology can be readily adapted for use in revenue adequacy proceedings by applying the road property investment asset values that the Board proposes to use in SSAC cases to determine the road property investment of the entirety of a rail carrier's existing system

Use of the Board's SSAC methodology to make revenue adequacy determinations addresses the most significant practical difficulties that led the ICC to reject a replacement cost approach in the 1980s. A major problem encountered by the ICC was the difficulty of estimating the cost to replace existing railroad assets of different vintages with assets of the same age and condition In addition to providing Board approved replacement cost values, the SSAC methodology features the use of a Discounted Cash Flow ("DCF") model borrowed from Full-SAC cases that allows the calculation of a revenue requirement for a test year by using replacement costs new, rather than estimated replacement costs of assets of different vintages Use of the Board's SSAC methodology also addresses other practical concerns that the ICC had with a replacement cost methodology, such as the ICC's concern over how to account for obsolescence and changes in productivity since the original investments were made SSAC costs reflect the least cost, most efficient costs that would be incurred today by a railroad to replace its assets

In this Petition, AAR proposes practical procedures for adapting the Board's SSAC methodology to make annual revenue adequacy determinations While the simplifying assumptions built into SSAC undoubtedly result in some sacrifice in accuracy, there can be no serious dispute that use of replacement costs is far superior to the Board's current approach of relying on net book values The Board has already concluded that the simplifications inherent in the SSAC replacement cost procedures do not compromise the integrity of its rate reasonableness determinations Nor will use of these assumptions compromise the integrity of its revenue adequacy procedures On the contrary, they will improve those procedures by allowing the Board to apply a competitive market standard to assess revenue adequacy based on replacement costs, just as the use of the CAPM methodology applies a competitive market standard to determine the cost of equity capital

AAR's witness, Mr Baranowski, demonstrates the feasibility of implementing AAR's proposed methodology in annual revenue adequacy proceedings by developing preliminary results for four Class I railroads – BNSF, CSX, NS and UP – using 2006 data His results are set out in Table 1 in Section III.D below and described in more detail in his accompanying verified statement These preliminary results, if corroborated through more refined procedures adopted in a rulemaking proceeding, show that notwithstanding the progress made since the Staggers Act, the Nation's largest railroads were revenue inadequate for 2006 This result is not surprising given the capital intensive nature of the railroad industry and the vast need for capital expenditures to maintain and expand the rail infrastructure in the face of growing demand

AAR urges the Board to issue a Notice of Proposed Rulemaking in which the Board proposes adoption of AAR's replacement cost methodology for determining revenue adequacy The policy rationale for pursuing this course is a powerful one The determination of railroad revenue adequacy is a core Board function that involves the critical real world question of railroad financial health. Not only do railroads face enormous capital requirements to maintain their existing systems, there is a widely acknowledged public need for enhanced rail infrastructure, expanded rail capacity and improved rail service.[2] The Board's revenue adequacy methodology should answer the question of whether a railroad is earning enough money to replace its assets.

ARGUMENT

AAR raised the possibility of using replacement costs in the Board's revenue adequacy determinations last year in the context of comments that it submitted in Ex Parte No. 664, where the Board considered and ultimately adopted changes in determining the cost of equity capital. AAR suggested that any review of the Board's cost of capital methodology should be accompanied by a review of the valuation of the railroads' asset base. *See Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, Ex Parte No. 664, slip op. at 9 (served August 20, 2007) ("*EP 664 August 2007 Decision*"); *see also Comments of the Association of American Railroads on Advance Notice of Proposed Rulemaking*, Ex Parte No. 664, at 20-21 (filed December 8, 2006). AAR urged that if the Board were to change one element of its revenue adequacy standard, it should also consider adopting a replacement cost methodology for the valuation of railroad assets.

The Board decided not to address the implementation of a replacement cost methodology in the cost of capital proceeding, noting that AAR "has not attempted to demonstrate here how

[2] *See* Cambridge Systematics, Inc., *National Rail Freight Infrastructure Capacity and Investment Study* (Sept. 2007), Federal Highway Administration, *Freight Analysis Framework* (Oct. 2002), FHWA-OP-03-006 (R), *available at* www.ops.fhwa.dot.gov/freight/documents/faf_overview.pdf, American Association of State Highway and Transportation Officials, *Freight-Rail Bottom Line Report* (2003).

we could perform this complex analysis" *EP 664 August 2007 Decision* at 9 But the Board invited AAR to "file a petition for a separate rulemaking" if AAR could "offer a practical means to implement a replacement-cost approach. . . ." *Id* In this Petition, AAR sets out a thorough explanation of how the Board can implement a practical replacement cost approach to determine revenue adequacy Thus, AAR has presented "adequate justification for opening a rulemaking proceeding," 49 C F R. § 1110 2(e), and it therefore satisfies the requirements in the Board's rules for the initiation of a rulemaking proceeding

I. The Superiority of Using the Replacement Costs of Railroad Assets Instead of the Book Value of Assets for Purposes of Determining Revenue Adequacy Is Beyond Serious Dispute

The Board currently assesses the adequacy of railroad revenues using railroads' net book value of assets There is no economic justification for the use of net book value as the asset base for revenue adequacy determinations Net book value has been used since the early 1980s only because a practical replacement cost methodology has not, until now, been presented to the agency for its consideration There is no serious question that as a matter of economics and finance theory, the proper asset value for determining the level of revenues needed by railroads to maintain themselves over the long term is the cost to replace railroad assets today, not the depreciated book value of the assets

A. In Competitive Markets, the Level of Annual Revenues Necessary to Sustain a Firm Over the Long Term Is Determined by Reference to the Costs to Replace the Firm's Assets

The current revenue adequacy standard was adopted shortly after Congress enacted the Staggers Act In 1981, the ICC concluded that "revenue adequacy standards must be based on a rate of return equal to the current cost of capital" *Standards for Railroad Revenue Adequacy*, Ex Parte No 393, 364 I C.C 803, 807 (1981) ("*1981 Decision*") The ICC recognized that railroads cannot attract the capital they need unless they are allowed the opportunity to earn competitive returns on their investment "If a firm is unable to earn the cost of capital, investors will be unwilling to supply capital to it." *Id* at 809

The ICC also recognized that adoption of this revenue adequacy standard required a careful and accurate calculation of the railroads' investment base: "If we are to use the cost of capital to measure rate of return, and rate of return to measure revenue adequacy, then accurately measuring the investment base on which the rate of return is predicated is critical " *Id* at 811. However, Congress in the Staggers Act gave the ICC only 180 days to establish standards and to conduct revenue adequacy determinations for all Class I railroads, so the ICC initially decided to use the original costs reflected in the railroads' books – the original cost of track assets plus betterments and the depreciated book value of all other assets – given the relative simplicity of the required calculations

The ICC left open the possibility that replacement costs would be used in future revenue adequacy determinations and it expressed a clear preference for the use of replacement costs if a practical replacement cost approach could be identified "While we perceive some difficulty in implementing a replacement cost valuation method, we believe that it is conceptually the best method available " *Id* at 820 The ICC explained that a "replacement cost method is preferable because it comes closer to the competitive result That is, at any point in time, the revenue requirement implications of using replacement costs are closer to the return on investment that would be required by a competitive market." *Id* at 818-19

In 1983, the ICC initiated a proceeding to explore the possibility of adopting a replacement cost approach The ICC considered adopting an index-based approach to estimating the replacement cost of the railroads' existing assets that reflected the actual vintage of those assets, referred to as "Trended Net Original Cost" (TNOC) The proposed TNOC methodology used various inflation indices to estimate the current inflation-adjusted cost of the railroads' original asset investments and various depreciation charges to derive a current, depreciated value of those assets *Standards for Railroad Revenue Adequacy*, Ex Parte No 393 (Sub-No 1), 48 FR 10144 ("*1983 Decision*") In 1986, the ICC concluded that such an approach was not appropriate. "While current cost accounting is theoretically preferable to original cost valuation, it cannot be practically implemented in a manner that we can be confident would produce accurate and reliable results " *Standards for Railroad Revenue Adequacy*, Ex Parte No 393 (Sub-No 1), 3 I C C 2d 261, 277 (1986) ("*1986 Decision*")

While the ICC concluded that practical considerations foreclosed use of the TNOC replacement cost approach, the ICC continued to acknowledge the superiority of using replacement costs in assessing revenue adequacy, noting that "the revenue requirements inferred by using replacement costs are more closely aligned with the investment returns required in a competitive market " *Id* at 276 Since railroads must compete for access to funds with other non-regulated firms in competitive markets, the revenues necessary for railroads to attract capital and remain in business over the long term should also be determined by reference to competitive market standards. In competitive markets, the level of revenues necessary to attract capital is determined by reference to the replacement costs of the firm's assets

A year after the ICC rejected its proposed TNOC approach, the Railroad Accounting Principles Board (RAPB) issued its final report on railroad accounting principles The RAPB reiterated the ICC's view that use of the replacement costs of railroad assets was the theoretically superior approach in revenue adequacy proceedings

> The argument for current market value valuation is that this methodology is consistent with economic principles which value assets in terms of opportunity cost In most cases, opportunity cost

> is measured by the replacement cost of assets with similar remaining productive lives and capacity

2 Railroad Accounting Principles Board, *Railroad Accounting Principles, Final Report*, 60 (1987) ("*RAPB Final Report*") The RAPB further explained that the use of replacement costs was superior to historical costs because the use of replacement costs was more consistent with competitive markets in which railroads must compete for available capital:

> The RAPB believes that current market valuation is preferable to historical valuation from a theoretical economic viewpoint In revenue adequacy applications, current market value represents the value upon which competitive returns must be earned to attract and retain capital

Id

The RAPB addressed the theoretical superiority of using the current market valuation of a railroad's assets. As the ICC recognized, it is not possible to determine the current market value of a railroad's existing assets, given, among other things, the diversity of a railroad's assets and the different vintages of those assets But as discussed below, the cost to replace a railroad's existing assets with new assets can be used to determine an annual revenue requirement for the railroad that is necessary to attract and retain capital investments in the railroad over the long term Thus, a replacement cost approach can be used in revenue adequacy proceedings without attempting to estimate the cost to replace a railroad's assets with assets of the same age and condition

Professor Kalt and Mr Klick explain in the attached verified statement that the ICC's and RAPB's conclusions regarding the superiority of replacement costs are consistent with finance theory. Investors in competitive markets value a firm's assets based on the productive value of those assets, assuming that the firm realizes competitive prices in the market in which it sells The productive value of assets is properly measured by the net present value of the cash flows that the assets can generate A firm must earn sufficient revenue to cover the cost to replace the assets with equally productive assets, or the assets will not be maintained and will not be replenished Thus, the replacement costs of a firm's assets are an appropriate starting point for calculating the revenues needed to achieve returns that allow the firm to sustain itself over the long term in contestable, competitive rail markets – as the statutory revenue adequacy requirement contemplates

In contrast to asset values based on replacement costs, asset values based on depreciated book costs tell nothing about the market returns required by investors Professor Kalt and Mr Klick explain that the depreciated book value of assets does not reflect the productive value of those assets today, particularly for long-lived railroad assets, and therefore cannot be used to determine the market returns required by investors. Indeed, as noted above, the ICC acknowledged as early as 1981 that "the revenue requirement implications of using replacement costs are closer to the return on investment that would be required by a competitive market" *1981 Decision*, 364 I C C at 818-19 Professor Kalt and Mr Klick illustrate the problems with the use of net book value by reference to an aged asset (an aging truck) that has been fully depreciated but that still has productive value They explain that the productive value of the old truck is unrelated to the net book value of the truck (which in their example is zero) The value of the truck is determined by the revenues it can generate in a competitive market and those revenues must be adequate to fund the cost of replacing the truck at the end of its useful life Thus, the level of revenues that a firm must earn in a competitive market to remain viable in that market over the long term is defined by the stand-alone costs of a new truck The value of the owners' investment and the revenues that must be earned for the investors to maintain and replenish the investment has nothing to do with the book value of the truck

Therefore, a market-based approach to measuring return on investment, and hence revenue adequacy, cannot be based on the net depreciated book value of assets. The appropriate value of an asset is reflected in its replacement cost And while the cost to replace an older asset with an asset of the same age is obviously lower than the cost to replace it with a new asset, as discussed below, finance theory teaches that the replacement cost of *new* assets can nevertheless be used to determine the level of revenues that investors in competitive markets would require, regardless of the age of the assets Indeed, this is the theory on which the Board's SAC and SSAC tests are based

B. The Intractable Problem of Estimating Current Replacement Costs Can Be Overcome by Using the Replacement Cost of New Assets as Inputs to a Discounted Cash Flow Model

When it explored the adoption of a replacement cost methodology for revenue adequacy purposes in the 1980's, the ICC concluded that "[w]hile current cost accounting is theoretically preferable to original cost valuation, it cannot be practically implemented." *1986 Decision*, 3 I C C 2d at 277 A primary focus of this practical limitation was the difficulty of estimating replacement costs of used assets

The replacement cost methodology considered by the ICC in the 1980s involved an estimate of the replacement cost of railroads' existing assets taking account of the age of those assets Similarly, the RAPB assumed that a replacement cost methodology would involve an estimate of the "replacement cost of assets with similar remaining productive lives and capacity " *RAPB Final Report* at 60

In its 1986 decision, the ICC agreed with the majority of respondents commenting on the use of replacement costs that such an approach was "speculative, subjective, and difficult to implement " *1986 Decision*, 3 I.C.C. 2d at 276 The ICC quoted a 1976 ICC decision that had concluded "To properly value railroad property which has depreciated, as well as property which has appreciated, would require valuation studies of the kind undertaken by the Commission in the 1920's Such studies . are not practical " *Id* at 282 (citation omitted) The ICC therefore rejected the use of replacement costs in revenue adequacy determinations in large part because there is no readily implemented methodology for accurately assessing the current replacement value of used railroad assets.

However, the problems associated with estimating the replacement cost of used assets of varying vintages can be overcome by using an estimate of the replacement costs *new* of a railroad's assets and a DCF model, such as the DCF model used by the Board in its SAC and SSAC procedures When the ICC initiated a proceeding in 1983 to consider adopting a replacement cost approach to revenue adequacy, the ICC had not yet adopted the Coal Rate Guidelines or the SAC methodology,[3] and it had no experience applying competitive market principles in assessing the reasonableness of railroad rates Since then, the ICC and the Board have adopted and refined the DCF model for use in SAC cases and the Board now has substantial experience applying the DCF model [4]

The DCF model used in the SAC and SSAC procedures calculates the revenues necessary to cover the cost of assets used to provide transportation service to a group of shippers in contestable (*i e.*, competitive) markets The costs used in the DCF analysis are the replacement costs new of the assets used to provide the service In essence, the DCF model used in SAC and SSAC procedures asks the same question addressed by the Board in revenue adequacy

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[3] *See Coal Rate Guidelines, Nationwide*, Ex Parte No 347 (Sub-No.1), 1 I C C 2d 520 (1985)

[4] The courts have upheld the ICC's use of competitive market principles in assessing the reasonableness of railroad rates and the specific SAC methodology that implements those competitive market principles, including use of the costs that would be incurred by a new railroad entrant to construct a stand-alone railroad. *See Consolidated Rail Corp v U S*, 812 F.2d 1444 (3d Cir 1987)

proceedings – what level of revenues is needed by a railroad to cover the full costs to provide service to the railroad's shippers and remain in business over the long term? Because the DCF model uses the replacement cost *new* of railroad assets, its use in revenue adequacy proceedings would allow the Board to avoid the practical difficulties in estimating the current replacement cost of a railroad's existing assets that led the ICC to reject a replacement cost approach in the past

The replacement costs new of railroad assets can be used because the DCF model assumes that in competitive markets, the costs of acquiring an asset will be recovered over the economic life of the asset When a DCF model is used to spread the recovery of asset costs over the lives of the assets, the same annual revenue requirement results in any given year, whether the cost of the assets is based on the current value of brand new assets, with their full economic life ahead of them, or based on the current cost of used assets, with less than their full economic life remaining. As a result, there is no need to try to estimate current costs to replace existing railroad assets with used assets – a task that the ICC found to be insurmountable Instead, the appropriate annual revenue requirement for revenue adequacy in any given year can be determined by using the current costs of new assets

Nearly twenty years ago, the RAPB recognized that use of a DCF model would allow the ICC to determine the level of revenues necessary to cover the cost of a railroad's assets based on the replacement costs of those assets *new*, even when the railroad's assets are of mixed vintages The use of a DCF model therefore allows the regulator to be indifferent to the age of a firm's assets in determining a revenue requirement for the firm. The RAPB explained this principle by contrasting the calculation of a railroad's revenue requirement using a DCF-based approach with the calculation of a revenue requirement using a "utility" approach Under the utility approach, the annual revenues required to recover the costs of assets are based on the net depreciated value of the assets in a particular year The annual revenue requirement therefore changes over time under the utility approach while the annual revenue requirement remains stable under the DCF approach As the RABP explained·

> The difference between the two approaches is illustrated by considering two railroads, one with entirely new assets and one with the same type of assets comprised of mixed vintages and valued at current market cost Under the utility approach, the railroad with entirely new assets will exhibit higher capital costs in the first year than the railroad with mixed assets Under the DCF approach, if the productivity of the assets for both railroads is constant over their entire lives, other things being equal (such as tax depreciation), both railroads would have the same [annual] capital costs In the DCF case, relative vintages of the railroads' assets are immaterial

RAPB Final Report at 68

Therefore, under a DCF approach, the annual revenues required to cover the costs of railroad assets can be determined either by reference to the cost to replace those assets new or by reference to the current cost of used assets of the same vintage as the railroad's existing assets. The resulting revenue requirement for a test year will be the same While the replacement cost new of railroad assets is clearly higher than the replacement cost of used assets, the costs of new assets are recovered over a longer period.[5] The relevant question in the revenue adequacy

[5] A railroad's existing assets acquired in prior years have fewer years of remaining productive life than the new assets that are used in the Board's SAC or SSAC procedures. The existing assets will generate revenues for fewer years than new assets, so an existing railroad with used assets would have a lower market value than a railroad entering the market today with new assets. But each year that the used assets are in service, they generate the same annual revenues as new assets In a competitive market, the annual revenue requirement for used assets is therefore the same as the annual revenue requirement for new assets. This allows the Board to use the replacement cost of a new railroad to determine the annual revenue requirement for an existing railroad providing the same service, regardless of the age of the existing railroad's assets The used assets will wear out sooner than new assets and will need to be replaced sooner, but the annual revenue requirement will not change based on where the assets are in their life cycle

context is what revenue is required in the test year in question to pay for the assets and provide for their eventual replacement. Under the assumptions built into the Board's DCF model, the annual revenue requirement is identical, regardless of the age of the assets. Therefore, the complications that arise from determining the current replacement cost of depreciated assets and the remaining economic life of those assets can be avoided by using replacement costs new without affecting the results of the revenue adequacy analysis

II. Since It Rejected Use of Replacement Costs as Impractical in the 1980's, the Agency Has Adopted Procedures that Can Be Readily Implemented as the Core Elements of a Practical Replacement Cost Methodology for Determining Revenue Adequacy

AAR proposes the adoption of a replacement cost revenue adequacy methodology that is based on established procedures that the Board itself has recently adopted in Ex Parte No 646 (Sub-No 1) for use in simplified SAC cases. There are two basic Board approved procedures that AAR proposes to adopt as core building blocks of its revenue adequacy methodology (1) AAR proposes to use SSAC procedures adopted by the Board in Ex Parte No 646 (Sub-No 1) to develop SAC derived replacement cost values of road property investment on a system-wide basis for a rail carrier (2) AAR proposes to use these replacement cost values as inputs into the Board's DCF model to determine whether a railroad is earning adequate revenues for the year in question Both procedures are Board endorsed and meet the dual objectives of being even-handed and easy to implement

A. The Board's Determination of Asset Values Through Contested Evidentiary Proceedings in SAC Cases Yields Reliable Estimates of Replacement Costs New

The ICC's primary concern in rejecting a replacement cost proposal in 1986 was that a replacement cost approach "cannot be practically implemented in a manner that we can be confident would produce accurate and reliable results" *1986 Decision*, 3 I.C C.2d. at 277. AAR's proposal addresses this concern by using road property investment ("RPI") costs developed in accordance with the Board's own Ex Parte No. 646 (Sub-No.1) procedures. The Ex Parte No. 646 (Sub-No 1) RPI costs are replacement costs derived from the Board's determination of RPI costs in Full-SAC cases These RPI costs are based on extensive data submitted by the parties and carefully scrutinized by the Board. The replacement costs calculated by Mr Baranowski based on the Board's SSAC procedures represent over 82 percent of the total replacement costs of railroad facilities *See Baranowski* V S at 3 Therefore, the use of RPI costs from prior SAC cases yields reliable estimates of the replacement costs for the majority of a railroad's investments

The RPI costs used in SAC cases represent the replacement costs new of a railroad's road property investment [6] The use of the Ex Parte No 646 (Sub-No 1) RPI costs in revenue adequacy proceedings therefore produces an estimate of the replacement costs new of a railroad's road property assets As noted above, the use of replacement costs new eliminates complex issues relating to the actual age of the railroad's road property assets In addition, the fact that the values of road property investments to be used in SSAC cases were derived from the Board's determinations in Full-SAC cases makes them sufficiently reliable for use in revenue adequacy proceedings

In its December 1986 revenue adequacy decision, the ICC rejected the railroads' proposal to "accept estimates developed by the railroads as the basis for valuation of their investment base

[6] The Board has explicitly identified the asset values used in SAC and SSAC proceedings as replacement costs As the Board explained in its decision in Ex Parte No 646 (Sub-No 1), "[t]he principal objective of the SAC constraint is to restrain a railroad from exploiting market power over a captive shipper by charging more than it needs to earn a reasonable return on the *replacement cost* of the infrastructure used to serve that shipper." *Simplified Standards*, slip op at 14 (served September 5, 2007) (emphasis added). Moreover, "[t]he core analysis in a Simplified-SAC proceeding will address the *replacement cost* of the existing facilities used to serve the captive shipper and the return on investment a hypothetical SARR would require to replicate those facilities " *Id.* at 15 (emphasis added).

at current costs, supplemented by direct pricing " *1986 Decision*, 3 I C.C.2d at 280 The agency said that this proposal "lacks objectivity, since it would rely on the railroads' subjective estimates for a valuation that would serve as an important determinant of their own future rate flexibility " *Id* AAR's proposal addresses this concern by using the same RPI values that the Board will use in SSAC cases These values solve the problem of lack of objectivity that the Board previously identified because the RPI values are derived from Full-SAC cases in which the values have been determined by the Board itself based on the contested evidentiary record in Full-SAC cases

The ICC also noted in its 1986 decision that several parties had expressed a concern that a replacement cost standard might overstate a railroad's asset base for revenue adequacy purposes by including the replacement costs of assets that were no longer used or useful *1986 Decision*, 3 I C C 2d at 288 A year later, the RAPB expressed a similar concern that a replacement cost approach would need to address the possible obsolescence of railroad assets and changes in productivity *RAPB Final Report* at 60 This concern is addressed in AAR's proposal by using replacement cost values developed in Full-SAC cases The development of SAC costs accounts for obsolescence and productivity since the stand-alone railroad ("SARR") is constructed based on the most efficient current construction techniques. When applied to a railroad's existing network, these SAC costs reflect the least cost, most efficient costs that would be incurred today by a railroad to replace its assets For example, although a bridge on a railroad's network will be replaced if it exists today, the replacement cost will not be measured by what it would cost to build exactly the same bridge using the methods of the 1920s, but instead will be measured by what it would cost to build a bridge at that location today using modern construction techniques

B. SAC Replacement Costs Can Be Developed for a Carrier's Entire Rail Network Through Application of the Board's Simplified SAC Procedures to the Entire Rail Network

In Ex Parte No 646 (Sub-No 1), the Board decided that it could use values developed in Full-SAC cases to determine replacement costs for a subset of a carrier's system in SSAC cases. The Board also adopted the assumption "that all existing infrastructure along the predominant route used to haul the complainant traffic is needed to serve the traffic moving over that route This is a reasonable simplifying approach " *Simplified Standards*, slip op. at 14 (served September 5, 2007)

For revenue adequacy purposes, the same SAC replacement cost values used in SSAC cases can be applied to a carrier's system in its entirety, rather than to a subset of its system In today's environment of constrained capacity, it is reasonable to assume that railroads are efficiently configured and that their systems will be replaced over time using efficient, modern construction techniques This might have been a questionable assumption in the early 1980s, when the effects of deregulation were only beginning to be felt. But the railroads have spent years since then paring down their systems. As the Board recognized in its decision in Ex Parte No 646 (Sub-No.1), "[r]ailroads no longer are burdened by substantial excess capacity, rather, the rail industry now faces the opposite situation Rail capacity is strained, demand for transportation service is forecast to increase, and railroads must make capital investments to meet that demand " *Simplified Standards*, slip op at 14 (served September 5, 2007). The Board's assumption that existing assets of subsets of rail networks are used and useful logically applies to a carrier's rail system as a whole

C. The DCF Model as Implemented In SSAC and Full-SAC Cases Addresses Issues of Asset Vintages and Depreciation

One of the practical problems identified by the ICC in its consideration of a replacement cost methodology in the 1980s was the difficulty of adjusting historical asset values to produce a current replacement cost of a railroad's assets The Board's DCF model overcomes this practical difficulty because the DCF model is indifferent to the age of a railroad's assets It yields the same year-one revenue requirement regardless of whether a new or used asset is considered. Thus, the Board can assess revenue requirements for a railroad based on the SAC replacement cost values used in SSAC cases, which are replacement costs new of the railroad's assets Use of the DCF model makes it unnecessary to consider the actual age of the railroad's assets in determining the annual revenues required to cover the replacement cost of those assets

Professor Kalt and Mr Klick explain that the DCF model allows the Board to be indifferent to the actual age of a railroad's assets because it takes account of the economic depreciation of assets Economic depreciation in any given year is the decline in the remaining productive value of an asset experienced in that year The DCF model assumes that an asset has an identical productive value in each year of its useful life and that its value is extinguished at the end of its useful life This is a valid assumption in an industry where assets are constantly maintained to avoid degradation of service that could otherwise occur as a result of the aging of assets Under these circumstances, the decline in the present value of the future productive value of an asset (the return *of* capital, or depreciation) plus the return on the present value of the remaining future productive value (the return *on* invested capital) will be the same regardless of the age of the asset *See, e g* , Exhibit No __ (Kalt/Klick-3) (showing that in a particular year the return on capital plus economic depreciation is the same in the two scenarios notwithstanding the differences in the age of the underlying assets) This is the key insight incorporated in the

Board's DCF model used in SAC and SSAC cases, and it allows the Board to assess a railroad's revenue adequacy using the replacement costs new derived from SAC cases

D. The DCF Model Used in SAC and SSAC Procedures Allows the Board to Calculate a Revenue Requirement Using the Nominal Cost of Capital

In its August 2007 Notice of Proposed Rulemaking in Ex Parte No. 664, the Board stated that "switching to a replacement-cost analysis would also require use of a real cost of capital" *EP 664 August 2007 Decision* at 9. It therefore noted that any proposal for the use of replacement costs in revenue adequacy proceedings would have to explain how a real cost of capital could be calculated. The RAPB also commented in its Final Report that the use of a current cost asset base in revenue adequacy determinations would require an estimate of the real cost of capital *RAPB Final Report* at 61

Unlike its use in the Board's existing revenue adequacy determination, where the cost of capital is compared to a percentage derived from net railway operating income divided by average net investment base, the railroad industry cost of capital is used as a discount rate in the Board's DCF model Whether that discount rate should include a factor recognizing inflation (the nominal cost of capital) or exclude a recognition of inflation depends on whether the revenue requirement being discounted has or has not been adjusted to reflect inflation Professor Kalt and Mr. Klick explain that the Board's DCF model can use either a real or nominal cost of capital to calculate a Year 1 revenue requirement, depending on how inflation is treated in the escalation of the revenue requirement over the DCF period The DCF model used in SAC and SSAC procedures uses the nominal cost of capital and assumes that the revenue requirement escalates each year at the rate of inflation anticipated in railroad construction costs A DCF model using the nominal cost of capital produces the same starting revenue requirement (Year 0) as a DCF analysis that uses a real cost of capital. *See* Exhibit No _(Kalt/Klick-6) and corresponding text Since both approaches produce the same starting revenue requirement, it is not necessary to estimate the railroad industry's real cost of capital and any complexities involved in making such an estimation can be avoided

E. Use of the Board's SSAC-Based Procedures for Revenue Adequacy Determinations Answers the Question Whether a Railroad Is Earning Adequate Revenues in the Competitive Market Context

The Board's SAC and SSAC procedures are essentially tests for revenue adequacy focused on a subset of a rail network Professor Kalt and Mr. Klick explain that the SAC and SSAC procedures determine the level of revenues that would be required in a competitive market to induce investors to commit their capital to a railroad that serves a particular set of shippers Investors in such competitive railroad markets must be able to earn a return of their investments and a return on their investments equal to the railroad industry's cost of capital or they will not commit capital to the industry If investors in competitive markets are not allowed to earn such revenues, they will withdraw their investments and the firms will eventually cease to exist. The SAC and SSAC procedures thus determine the revenue required for a given period (20 or 10 years in Full-SAC cases, one year in SSAC cases) to sustain investment in railroad assets over the long term This is the same question that is addressed for a one year period by the Board's annual revenue adequacy determination

The SAC and SSAC procedures simulate competitive market behavior by assuming that there are no barriers to entry or exit in railroad markets As Professor Kalt and Mr Klick explain, the revenues that would be earned by a firm in a competitive market without entry or exit barriers are based on the revenues needed to generate a rate of return that is adequate to attract new investments necessary to satisfy growing demand and to replace older assets as they retire from service The annual revenues required to sustain a carrier are the same regardless of the age of a particular firm in the market These principles are the foundation of the Board's

SAC and SSAC procedures Implementing these principles in the context of revenue adequacy determinations allows the Board to apply a unified economic theory to two of its most important and interrelated regulatory functions – rate reasonableness determinations and revenue adequacy determinations

The SAC and SSAC procedures address the revenue adequacy question by using the DCF model to determine a revenue requirement necessary to generate a return on investment equal to the railroad industry's cost of capital and then comparing that revenue requirement to the revenues earned by the carrier (adjusted as described below) whose revenue adequacy is being assessed. The Board's current revenue adequacy formula determines whether a railroad's return on investment equals or exceeds the railroad industry's cost of capital. As Professor Kalt and Mr Klick explain, the two approaches are functionally equivalent If a railroad earns revenues (adjusted as discussed below) in a particular year equal to or greater than its SSAC revenue requirement determined by using the cost of capital as the discount rate, then it is earning its cost of capital for that year, if its adjusted revenues are below the SSAC revenue requirement, then the revenues are generating a return below the railroad industry's cost of capital Although the revenue requirement is the standard output of the Board's DCF model, Mr Baranowski explains that the Board's DCF model can also be applied to determine the return actually earned by a railroad on its replacement costs, and that return, expressed as a percentage, can be compared to the railroad industry's cost of capital, as is done under the Board's current revenue adequacy formula to determine whether the railroad is earning its cost of capital.

III. Using SSAC to Evaluate Revenue Adequacy on a Yearly Basis is Feasible

A. The General Approach

To comply with the governing statute and to be useful for the Board' regulatory purposes, a revenue adequacy methodology must be able to produce revenue adequacy determinations on a yearly basis The Board's SSAC procedure, which is designed to assess rate reasonableness for a single test year, satisfies this requirement SSAC can be used to evaluate revenue adequacy annually for an entire rail network using the same basic procedures that would apply to a subset of the carrier's system in a rate case With modest modifications proposed by AAR, inputs for the Board's DCF can be developed using the procedures set forth in Ex Parte No 646 (Sub-No 1), and the output of the DCF can be used to measure a carrier's revenue adequacy

To demonstrate the feasibility of using SSAC for revenue adequacy purposes, AAR witness Mike Baranowski used SSAC procedures to develop inputs for the Board's DCF model for four Class I railroads – BNSF, CSX, NS, and UP – using 2006 data As explained in more detail below, and in the accompanying statement by Mr Baranowski, the inputs into the DCF model for most asset classes for each railroad's entire network were determined using the procedures set forth in Ex Parte No 646 (Sub-No 1) [7] Once the inputs were determined, Mr Baranowski used the Board's DCF model, with a 2006 industry cost of capital determined using CAPM as the discount rate, to calculate an annual capital carrying charge (or revenue requirement) for each of these railroads This revenue requirement is the amount of operating income necessary for the railroad to earn its cost of capital, pay taxes as they come due after accounting for depreciation and tax-deductible interest, and reinvest in the railroad as required In other words, the revenue requirement represents the operating income needed for the railroad to be revenue adequate The revenue requirement for the first year generated by the DCF can be

[7] As explained below, for some asset classes alternative methods were developed because (1) for land, there are practical difficulties in implementing the categorization approach specified by the Board in Ex Parte No 646 (Sub-No 1) on a network-wide basis, (2) in the case of various equipment categories, *e g* locomotives and railcars, the Board's model treats expenses as operating costs whereas some of those costs need to be treated as capital costs for revenue adequacy purposes, and (3) other asset categories, *e g*, TOFC/COFC terminals, have not been involved in recent Full-SAC cases and therefore have not previously been included in the Board's DCF model

compared to a railroad's actual revenues – adjusted to place them on a comparable basis with the revenue requirement – for the same year to determine whether the railroad earned adequate revenues in that year.[8]

The revenue adequacy calculations for 2006 submitted with this petition are not intended to be viewed as definitive determinations of revenue adequacy for that year Such definitive calculations can only be made once the Board has adopted a replacement cost revenue adequacy methodology AAR's calculations illustrate that it is feasible to estimate revenue adequacy using the data sources and methodology proposed by AAR

B. Calculation of Inputs into the Board's DCF Model

1. Replacement Costs Calculated Using Ex Parte No. 646 (Sub-No.1) Procedures

In its decision in Ex Parte No 646 (Sub-No 1), the Board set forth simplifying assumptions to be employed in calculating asset values at the replacement cost level as inputs for the DCF in eight road property categories land, roadbed preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, and public improvements. *Simplified Standards*, slip op. at 38 (served September 5, 2007)[9] In a SSAC case involving a challenge to a rail rate, these asset values are calculated for the subset of the defendant carrier's

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[8] Operating costs, and the operating cost portions of the spreadsheets used in SSAC and Full-SAC cases are not used for determining the annual revenue requirement Revenue adequacy is based on whether a railroad earns a sufficient return of and return on invested capital Operating costs must be covered from revenue, but the railroad does not earn a return on those operating costs. For that reason, the revenue requirement generated by the Board's DCF is properly compared to a revenue figure that is net of operating expenses for revenue adequacy purposes. However, since the Board's DCF revenue requirement includes revenues needed to cover depreciation and taxes, a railroad's net operating income would not be reduced to account for depreciation or tax expenses for purposes of the revenue adequacy determination The necessary adjustments to railroad operating income are discussed further below.

[9] In addition, the Board specified how mobilization, engineering, and contingencies were to be addressed *Id*

system that is assumed to be replicated by the SARR. In AAR's proposed revenue adequacy calculation, assets are identified for the entirety of the carrier's system. As explained in his statement, Mr Baranowski followed these procedures for each of these asset categories with the exception of land, which is addressed below

To develop inputs for the SSAC DCF, Mr. Baranowski collected a significant amount of information from the railroads and from public sources The railroads provided detailed inventory information for their tunnels, bridges, culverts, and grade separated crossings that included the data necessary to classify the assets into the categories required under Ex Parte No 646 (Sub-No 1) and to apply the specified unit costs In addition, as Mr Baranowski explains in his statement, Mr Baranowski collected data from the engineering reports held at the STB archives necessary to calculate earthworks quantities for the entire BNSF and CSX networks

Although the data collection efforts were thorough and detailed, data collection will not constitute a significant ongoing burden in annual revenue adequacy determinations There is a substantial amount of work involved in developing the inventory and earthwork quantity data for the first time, but that initial process does not need to be repeated Once the initial data have been collected for each railroad, the data can be updated as part of the annual submission each year to reflect changes in the railroad's asset inventories The process of making annual additions to and deletions from asset inventories would be much less cumbersome and time consuming for the railroads than was the initial collection of data

Mr Baranowski describes in detail in his statement how the Ex Parte No 646 (Sub-No.1) SSAC requirements were implemented for each asset category A brief description of the procedures he followed and issues that arose is provided below

Roadbed Preparation. The Board's decision in Ex Parte No 646 (Sub-No 1) specifies average unit costs for earthworks per cubic yard and additional unit costs on a route-mile basis. Determination of the number of route-miles in a carrier's network is straight-forward, but as Mr. Baranowski explains, developing the number of cubic yards of earthworks for each carrier's network is more complicated Earthwork quantities must be found in the original engineering reports and converted to modern quantities using the procedures applied in Full-SAC cases For purposes of demonstrating the feasibility of using SSAC for revenue adequacy purposes, Mr Baranowski undertook the calculation of precise earthworks quantities for one western railroad (BNSF) and one eastern railroad (CSX) The original engineering reports covered nearly the entire networks for both of these carriers For those portions of the networks not covered in the engineering reports, Mr Baranowski made reasonable estimates of earthworks quantities as described in his statement Mr Baranowski also estimated earthworks quantities for UP and NS based on the earthworks quantities and proportions for BNSF and CSX, respectively. If the Board adopts AAR's recommendation to use SSAC for revenue adequacy purposes, it is AAR's expectation that earthworks quantities for all of the Class I railroads would be developed based on the original engineering reports and the estimation methodologies applied to BNSF and CSX for the portions of networks not covered by the engineering reports.

Track. Under the procedures specified in Ex Parte No 646 (Sub-No 1), there are two components to track replacement costs· a per-track mile cost based on average costs from prior Full-SAC cases and a cost for ballast and subballast for which the Board anticipated that parties in individual SSAC cases would submit evidence Mr Baranowski calculated the first set of track costs based on track miles reported for each carrier in Schedule 700 to its R-1 Annual Report As Mr. Baranowski describes in his statement, ballast and subballast replacement costs were generated from estimates based on material and transportation costs and data from prior Full-SAC cases

Bridges. The Ex Parte No 646 (Sub-No.1) procedures provide for the development of bridge replacement costs based on a classification of bridges into one of three types and application of average per-foot unit costs derived from prior Full-SAC cases [10] Mr Baranowski used the inventory data provided by each railroad to classify the bridges, determine the number of feet per bridge, and calculate a total replacement cost

Culverts. The Ex Parte No. 646 (Sub-No 1) procedures also specify that culvert replacement costs will be calculated based on classification of culverts into one of three types and average unit costs developed from regression equations that depend on the culvert type and cross-section As was the case with bridges, Mr Baranowski used the inventory data provided by each railroad to classify the culverts and then calculate culvert replacement costs

Tunnels. The Ex Parte No 646 (Sub-No 1) procedures contemplate that parties in individual SSAC cases will submit evidence on tunnel costs For purposes of demonstrating the feasibility of using SSAC for revenue adequacy purposes, Mr Baranowski developed estimates of the cost per linear foot of constructing single track and multi-track tunnels Mr Baranowski applied these average costs to the inventory data provided to generate a total tunnel replacement cost input for each railroad

Signals and Communications. The Board's decision in Ex Parte No 646 (Sub-No 1) provides for calculation of signal and communication replacement costs on a route-mile basis using average costs from prior Full-SAC cases Although costs in Full-SAC cases are typically

[10] The Ex Parte No 646 (Sub-No 1) procedures also provide an alternative method for determining bridge costs for western railroads based on a trend curve Mr Baranowski did not use this alternative method in his analysis

based on CTC systems, Mr. Baranowski explains that they nonetheless provide a suitable proxy for the more diverse signaling and communication systems employed by real-world railroads that transport more than a single commodity Mr. Baranowski therefore applied the unit costs from EP 646 to the route miles for each of the railroads

Buildings and Facilities The Ex Parte No. 646 (Sub-No 1) procedures specify that building and facility costs are to be determined based on a simple regression that calculates the relationship between volume and cost per ton for such facilities As Mr Baranowski explains in his statement, the regression analysis specified by the Board does not provide a good estimate for a complete rail network that carries more than coal, that includes facilities that are not present in coal-only Full-SAC cases, and that carries significantly higher volumes than a typical SARR For purposes of calculating replacement costs for AAR's Petition, Mr. Baranowski modified the regression analysis and included additional replacement costs for some types of buildings and facilities not present in coal Full-SAC cases

Public Improvements. In its decision in Ex Parte No 646 (Sub-No 1), the Board established separate average costs for grade crossings with and without separation Mr Baranowski reviewed the inventory information received from the railroads and applied the appropriate average costs to determine total replacement costs for public improvements

2. Modifications or Supplements to Asset Valuation Procedures in Ex Parte No. 646 (Sub-No.1) for Certain Replacement Costs

a. Land

It is consistent with AAR's overall replacement cost approach to include a return on investment in land valued at the cost that would be incurred to acquire land today In Ex Parte No 646 (Sub-No 1), the Board specified that the land input for the SSAC DCF was to be computed by classifying land as agricultural, commercial, industrial, or residential and then applying average per acre costs derived from prior Full-SAC cases While the specified approach is a valid simplification for rate reasonableness uses, it presents practical difficulties when applied to an entire network because railroads generally do not maintain records that readily permit a classification of land into the categories specified by the Board Accordingly, AAR proposes using the book value of land, which is what Mr Baranowski used for his calculations AAR submits that this is a reasonable simplification in the absence of a more appropriate approach. Book value is very conservative and clearly understates the actual value of land given that much railroad land was acquired long ago, that railroads have significant land holdings in urban areas, and that land values have generally increased over the years If AAR is able to develop a more appropriate method to address the replacement costs of land, it will be submitted to the Board

b. Equipment

The Board's SSAC procedures as set forth in Ex Parte No 646 (Sub-No 1) do not establish replacement costs for the equipment accounts covered by the railroads' annual R-1 reports.[11] In some cases, such as for locomotives and freight cars, costs are addressed as operating expenses under SSAC [12] For revenue adequacy purposes, railroads are entitled to earn enough to receive a return of and a return on all of their capital assets, which means that the replacement cost of equipment that is treated by a railroad as a capital asset should be included as an input to the DCF model Including the replacement costs for these capital items means that the capital carrying cost calculated using the DCF model will generate an annual revenue

[11] Equipment asset categories not included in the SSAC DCF model include locomotives (52), freight-train cars (53), passenger-train cars (54), highway revenue equipment (55), floating equipment (56), work equipment (57), miscellaneous equipment (58), and computer systems and word processing equipment (59)

[12] SSAC does include a return of and return on investment in locomotives and freight cars recorded as capital assets, but as part of the "operating" expense calculated using URCS.

requirement that provides for a return on and return of these assets as well as for the road property assets covered by the Board's SSAC procedures

For purposes of his feasibility demonstration, Mr Baranowski included replacement costs for these assets as inputs into the Board's DCF model For locomotives and freight cars, Mr Baranowski developed specific procedures for calculating the replacement cost input as described in more detail below and in his verified statement For the other equipment categories, gross book value was used as a proxy for replacement cost new For all equipment asset categories, average asset lives for that category were used to specify the length of the replacement cycle

(1) Locomotives

To calculate locomotive replacement cost inputs, Mr Baranowski determined, based primarily on data from R-1 annual reports, both the number of new locomotives each railroad would purchase to replace existing locomotives and the per unit replacement cost Mr Baranowski performed two separate calculations for each railroad, one for higher horsepower locomotives used primarily for line-haul movements and one for lower horsepower locomotives that perform switching and other non-line-haul functions The total locomotive replacement cost is the sum of the higher horsepower locomotive replacement cost and the lower horsepower locomotive replacement cost

For high-horsepower locomotives, Mr Baranowski determined the number of replacement units that would be required based on the assumption that fewer new locomotives are necessary to replace an existing fleet because newer locomotives tend to be more powerful than older locomotives For each railroad, Mr Baranowski calculated how much of the total aggregate horsepower capacity reported in the 2006 R-1 schedule 710 was attributable to owned locomotives[13] He then divided the resulting aggregate horsepower capacity figure by the horsepower rating of a new replacement locomotive, either 4000HP or 4400HP depending upon the railroad, to calculate the number of replacement units that would be needed.[14] The locomotives were then subdivided into AC-powered and DC-powered categories based on the current mix of AC and DC power for each railroad

Mr Baranowski used data contained in schedule 710S of the R-1 for the four railroads to calculate a 2005-2007 average replacement cost for a 4400HP DC locomotive, a 4400HP AC locomotive, and a 4000HP DC locomotive These replacement costs were then multiplied by the appropriate unit number to determine a total freight locomotive replacement cost for each railroad

For lower horsepower locomotives, Mr Baranowski assumed that locomotives would be replaced on a one-for-one basis He therefore determined the number of replacement units required by reference to the number of multiple purpose and switch locomotives reported in the R-1 for each railroad.[15] Mr Baranowski calculated a 2005-2007 average replacement cost for lower power locomotives based on data contained in schedule 710S of the R-1s for the four railroads and multiplied that cost by the appropriate number of locomotive units to determine a total replacement cost for lower power locomotives.

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[13] For BNSF, CSX, and NS, Mr Baranowski used the aggregate capacity figure reported in the diesel-freight locomotive category For UP, Mr Baranowski used the capacity figure reported under the diesel-multiple purpose category as that is where UP reports the number and capacity of freight-haul locomotives it owns

[14] Mr Baranowski used 4400HP for all railroads except for NS. The NS R-1 data demonstrates that NS replaces older freight locomotives with 4000HP locomotives rather than 4400HP locomotives

[15] For UP, Mr Baranowski used only the number of units reported in the diesel-switching category as UP's high power locomotives are included in the multiple purpose category

(2) Freight Cars

As he did for locomotives, Mr Baranowski developed a replacement cost methodology for freight cars that was based on R-1 data filed by the railroads to the maximum extent possible The methodology involves two general steps (1) determining the number of replacement freight car units required for each railroad, and (2) applying an appropriate replacement unit cost to the replacement units to calculate a total replacement cost. As Mr Baranowski explains in greater detail in his statement, calculating the number of replacement units was feasible based on the R-1 data, but freight car purchases reported by the railroads in their R-1 reports did not provide sufficient data to determine replacement costs Mr Baranowski based his unit replacement costs for freight cars on data published by RailSolutions, Inc , in its 2006 *Investor's Guide to Railroad Freight Cars and Locomotives* [16]

Schedule 710 of the R-1 annual report contains freight car inventory for each railroad divided into 17 different categories of freight cars For each R-1 freight car category, Mr Baranowski determined what proportion of the reported aggregate capacity was attributable to freight cars owned by the railroad He then determined the number of replacement units required by dividing the owned aggregate capacity by the average per car capacity specified in the RailSolutions data for the appropriate car type To calculate the total replacement cost for each R-1 freight car category, Mr Baranowski multiplied the number of replacement cars for that category by a replacement unit cost derived from the RailSolutions data for car types encompassed within that particular R-1 freight car category The total freight car replacement cost for each railroad is the sum of the replacement costs for each R-1 freight car category

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[16] RailSolutions Inc provides consulting services relating to railroad equipment, including valuation of locomotives and railcars The 2006 *Investor's Guide to Railroad Freight Cars and Locomotives* can be obtained directly from RailSolutions, www railsolutionsinc com

c. Accounts Not Included in SSAC

The Full-SAC cases from which the costs used for SSAC are derived have all involved stand-alone railroads that transported exclusively, or almost exclusively, coal As a result, there are a number of STB asset categories for which replacement costs are not reflected in the SSAC procedures [17] A revenue adequacy calculation based on replacement costs should include a replacement cost input for these categories as well as for those already included in the Board's DCF model For these categories, AAR used gross book value as a proxy for replacement cost. The question of whether it may be advisable to develop an alternative method of estimating replacement costs for these categories can be addressed in the context of the proposed rulemaking proceeding

One asset category for which AAR believes that it is particularly important to develop a more precise method for estimating replacement costs is Account 25, which includes intermodal terminals and automotive facilities Railroads are making substantial and increasing capital investments in these facilities, particularly intermodal terminals, to satisfy shipper needs Given the magnitude of these investments, capital expenditures on such projects should be accurately reflected in the asset base used to evaluate revenue adequacy However, many of the railroads' existing intermodal and automotive facilities are old, and AAR believes that the gross book value of those investments is not an appropriate proxy for the costs to replace those terminals today AAR and its members support the development of an appropriate engineering-based methodology for estimating intermodal and automotive facility replacement costs consistent with the standards used in SAC cases to estimate replacement costs for significant rail facilities.

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[17] Accounts excluded from SSAC include elevated structures (7), water stations (18), wharves and docks (23), coal and ore wharves (24), TOFC/COFC terminals (25), power plants (29), power transmission systems (31), miscellaneous structures (35), roadway machines (37), and power plant machinery (45)

At the current time, BNSF has made a preliminary estimate of the current replacement cost of its intermodal and automotive facilities based on a bottom-up engineering approach that develops replacement cost values that would be applied to intermodal terminals and automotive facilities of BNSF and other rail carriers BNSF has applied those estimates to its own intermodal terminals and automotive facilities As explained in BNSF's supporting comments, the estimated replacement costs of its intermodal and automotive facilities ($2,719,395,627) substantially exceeds the gross book value ($854,226,000) reported for Account 25 in BNSF's 2006 R-1 Annual Report.[18]

For other asset Accounts that are not included in the Board's SSAC costs, the relatively small amount of investment covered by these categories does not justify, at this time, the effort that would be required to develop more accurate estimates of replacement cost In all cases, including intermodal and automotive facilities, Mr Baranowski set the replacement cycle according to the average lives of assets in each category.

C. Use of the Output from the Board's DCF to Evaluate Revenue Adequacy for the Year in Question

The Board's SSAC procedures set out in Ex Parte No 646 (Sub-No 1) contemplate calculation of a revenue requirement for the first year of the DCF period using the Board's DCF model As explained by Mr. Baranowski, AAR's proposed revenue adequacy procedures contemplate determining the revenue requirement for the first year of the DCF period for the entire system of the carrier in question

[18] Mr Baranowski shows that the use of BNSF's estimated replacement costs for intermodal and automotive facilities in place of the reported gross book value would increase BNSF's revenue requirement for 2006 from $8,377 2 million to $8,547 3 million and reduce its DCF-based return on investment from 6 04% to 5 92% *See* Baranowski V S. at Section II C 3.

The revenue requirement calculated using the SSAC DCF is the revenue that would be generated by a carrier, given its asset base, that was just earning the industry cost of capital If the carrier does not earn that revenue requirement, it is by definition not earning the industry cost of capital Therefore, whether a railroad earned adequate revenues in a given year can be determined by comparing the calculated revenue requirement to a railroad's actual revenue, adjusted as discussed below

As Mr Baranowski explains, the proper actual revenue figure for comparison purposes is net railroad operating income as traditionally calculated by the Board, with adjustments made to add back federal and state taxes and annual depreciation expenses These adjustments are necessary because the revenue requirement generated by the SSAC DCF includes revenues required to pay taxes and cover depreciation expenses For purposes of AAR's proposed methodology, this can be termed "modified net operating income."

Calculating a revenue requirement and comparing it to a railroad's modified net operating income is the most straightforward application of the DCF model in the revenue adequacy context and is fully sufficient to answer the question of whether a railroad is earning adequate revenues overall under a SSAC-based replacement cost approach The Board's current approach, however, assesses a carrier's revenue adequacy through a comparison of a calculated rate of return earned by the carrier in a given year to the industry cost of capital for that year As Mr Baranowski explains in his statement, it is also possible to express the results of the SSAC analysis in terms of a rate of return on investment that can be compared to the railroad industry cost of capital Specifically, the Board's DCF model can be used to solve for the rate of return on a railroad's SSAC-based replacement costs that is implied by the current level of the railroad's revenues. The resulting rate of return can be compared to the industry cost of capital to determine whether a railroad is earning adequate revenues as the Board's current formulation contemplates

D. Results for Specific Railroads

The 2006 revenue requirements, the 2006 modified net operating income, and the revenue shortfall for each of the four Class I railroads for which Mr Baranowski performed his analysis are summarized in the table below

TABLE 1
Summary of Alternate Revenue Adequacy Results
2006

Methodology	2006 Industry Cost of Capital	Calculated Returns: BNSF	UP	NS	CSXT
STB DCF Expressed as a Revenue Requirement ($ millions):					
Revenue Requirement		$8,377 2	$9,720 7	$6,844 6	$6,720 1
Modified Net Operating Income		4,659 6	4,162 1	3,194 3	2,451 0
Shortfall		$3,717 6	$5,558 6	$3,650 3	$4,269 1
SSAC-Based Replacement Costs:					
STB DCF Expressed as a Return on Investment	9 94%	6 04%	4 83%	5 50%	4 36%

As the table shows, the modified net operating income for each of the four carriers was below its SSAC DCF-based revenue requirement for 2006, and each of the carriers would therefore have been deemed not to have earned adequate revenues in 2006 The table also shows that when the results of the analysis are expressed in terms of a return on investment, each railroad earned less than the industry cost of capital

IV. The Board Should Issue a Notice of Proposed Rulemaking Proposing Adoption of AAR's Replacement Cost Approach to Determining Revenue Adequacy

A. Content of the Proposed Rule

AAR requests that the Board issue a notice of proposed rulemaking that proposes adoption of a replacement cost revenue adequacy methodology that is based on the Board's SSAC procedures. The proposed rule should specify the following

- Each Class I railroad would be required to make an annual submission that sets forth the results of a SSAC-based revenue adequacy analysis that follows the procedures described below

- Each Class I railroad will estimate the replacement cost of its railroad network on a system-wide basis using the cost assumptions and methodologies prescribed by the Board in Ex Parte No 646 (Sub-No 1) for SSAC cases, as supplemented by AAR's proposal in this Petition Each railroad will include in workpapers the specific assumptions used to produce the SSAC replacement cost estimates

- Specific provision would be made for how land, capital equipment, and asset accounts not currently included in the SSAC methodology would be handled depending upon the conclusions reached in the full rulemaking proceeding

- Each Class I railroad will calculate its operating income, using the Board's current NROI calculations adjusted to include depreciation expense and income taxes ("modified net operating income").

- The Year 1 revenue requirement generated by the DCF using the replacement cost assumptions described above and the cost of capital determined by the Board in its annual cost of capital determinations would be compared to the carrier's modified net operating income If the carrier's modified net operating income is less than the SSAC-based revenue requirement, the carrier would be deemed not to have earned adequate revenues in the year in question If the carrier's modified net operating income meets or exceeds the revenue requirement, the carrier would be deemed to have earned adequate revenues for that particular year

- If desired by the Board as an alternative to the above revenue requirement, each railroad could express the SSAC results in terms of a rate of return implied by the railroad's modified net operating income and compare that rate of return to the railroad industry cost of capital. If the railroad's rate of return is less than the railroad industry cost of capital, then the railroad would be deemed not to have earned adequate revenues in the year If the railroad's rate of return meets or exceeds the railroad industry cost of capital, the carrier would be deemed to have earned adequate revenues for that particular year.

B. Issues to Be Addressed in a Rulemaking Proceeding

As explained previously in this Petition, Professor Kalt and Mr Klick demonstrate the theoretical validity of using the SSAC-based DCF approach to assessing revenue adequacy Mr Baranowski further demonstrates that it is feasible to implement the SSAC-based revenue adequacy approach The Board should propose adoption of the approach described by AAR in this Petition and solicit comments from interested parties on that approach In addition, the Board should solicit comments on the specific methodologies to be used in annual revenue adequacy proceedings to develop replacement costs for the following asset categories

- Replacement costs for capital equipment accounts,
- Replacement costs for asset accounts not included in the SSAC procedures, including intermodal and automotive facilities,
- Replacement costs for land

In addition, the Board should propose the terms of a protective order for use in future annual revenue adequacy determinations for Class I railroads that would maintain the confidentiality of sensitive railroad information, and the Board should solicit comments on such a proposed protective order.

CONCLUSION

For the foregoing reasons and the reasons set forth in the attached verified statements of its witnesses, AAR respectfully requests that the Board initiate a rulemaking proceeding to adopt an approach to determining railroad revenue adequacy based on replacement costs of railroad assets

Respectfully submitted,

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May 1, 2008

KALT/KLICK

VERIFIED STATEMENT
OF
JOSEPH P. KALT AND JOHN C. KLICK

I. INTRODUCTION

We are Joseph P Kalt and John C Klick Professor Kalt is the Ford Foundation Professor of International Political Economy at Harvard's John F Kennedy School of Government He is also Senior Economist with FTI Consulting's Compass Lexecon subsidiary Mr Klick is a Senior Managing Director of FTI, and head of FTI's Economics Practice We each have a long history of research and consulting in the railroad sector, and we have provided testimony and advice on many occasions to the Surface Transportation Board ("Board" or "STB") Our work in this regard has focused on economic and policy issues associated with railroad transportation and the proper regulation of the rail industry Statements of Qualifications are attached as Exhibit Nos ___ (Kalt/Klick-1) and ___ (Kalt/Klick- 2), respectively

In the petition that this verified statement supports, the Association of American Railroads ("AAR") asks the Board to institute a rulemaking proceeding on a proposal to base its annual revenue adequacy determinations on the replacement cost of rail-related assets for each of the nation's major railroads, instead of the net book value of assets that has been used historically This proposal follows the Board's recent adoption of the Capital Asset Pricing Model ("CAPM") approach of modern finance theory in determining railroad rates of return in the context of the Board's assessments of railroad revenue adequacy [1] At the same time, the proposal also would bring the Board's revenue adequacy assessments in line with its long-standing policies of Constrained Market Pricing ("CMP") and its recent adoption of the SSAC procedures in Ex Parte No 646 [2] Counsel for AAR has asked us to examine the economics of its proposal and, in particular, to assess the propriety of the proposal from the perspective of principles of sound regulatory policy under the Board's overarching goals and legislative mandates.

II. OVERVIEW OF FINDINGS

The Board's embracing of modern financial economics as the basis for its cost of equity calculations has much to be said in its favor However, the same economics teach *that it is gross, textbook error to mix an economic approach to calculating the cost of* equity capital – such as CAPM – with historic, depreciated book accounting cost measures of the value of assets. The Board recognizes this, but has expressed the view that correcting this apples-and-oranges error would be fraught with practical concerns.[3]

AAR's proposal would harmonize the Board's adoption of an economically sophisticated approach to calculating the cost of equity capital with the measurement of the asset base to which that rate of return is applied in revenue adequacy analyses by calculating an annual benchmark revenue requirement necessary to achieve revenue adequacy that is consistent with a replacement cost measure of assets derived from familiar principles of Constrained Market Pricing ("CMP") We find that AAR's

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[1] STB Ex Parte No 664, *Methodology To Be Employed In Determining The Railroad Industry's Cost Of Capital*, January 17, 2008 ("*Cost Of Capital Methodology*")

[2] STB Ex Parte No 646 (Sub-No 1), *Simplified Standards For Rail Rate Cases*, (served September 5, 2007)

[3] *Cost Of Capital Methodology*, slip op at 16 See, also, at 2

proposed approach: (i) is consistent with the economics of CAPM,[4] (ii) determines an annual revenue requirement consistent with railroad asset values that would be observed under workably competitive (i e , CMP) rail market conditions and regulation, and (iii) is eminently feasible under approaches (in particular, under so-called "simplified SAC") already familiar to and adopted by the Board

As a threshold matter, AAR's proposal to use replacement costs is not a radical one To the contrary, when the ICC adopted its current standards for assessing railroad revenue adequacy, it explicitly recognized that valuing railroad assets at their replacement costs was both economically rational and most consistent with the competitive market standards of regulation that the ICC – and subsequently, the Board – have relied upon in regulating railroad rates for more than 20 years. Furthermore, in its recent decision to adopt the Capital Asset Pricing Model as the basis for its annual determination of the railroad cost of equity, one of the Board's primary justifications was an expressed desire to better reflect current financial best practice with respect to the returns demanded by investors in competitive capital markets As we discuss below, financial theory makes clear – as the ICC and the Railway Accounting Principles Board ("RAPB") recognized in the 1980s – that investors in competitive capital markets expect returns on investments that are comparable to returns they could earn by investing in other going concerns of comparable non-diversifiable risk Those comparable returns have nothing substantively to do with the depreciated book value of a firm's assets.

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[4] AAR's proposal is also consistent with the use of the multi-stage DCF approach under consideration by the Board (*Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital*, Ex Parte No 664 (Sub-No 1) (served Feb 11, 2008), which is also a market-driven measure *See also* fn 8, below

While the ICC recognized in the 1980s that use of the current replacement cost of a railroad's assets was more appropriate for revenue adequacy purposes, it found that the task of developing the current replacement cost for all assets for all of the Class I railroads then in existence each and every year, as required by statute for revenue adequacy purposes, was not a feasible one at that time As a result, the ICC developed revenue adequacy procedures based upon the net (depreciated) book values of railroad assets The ICC had a variety of reasons for adopting this "second best" approach, including the fact that under its adopted approach, the railroads were generating rates of return on net investment far below the industry's cost of capital Put another way, the decision to use net book values instead of current replacement costs had no effect – at that time – on the likelihood that a railroad would be found revenue adequate

Since that decision, railroads have gradually made progress toward achieving long-run revenue adequacy This is a tribute to the Board and the regulatory regime it has managed under the Staggers Act. At the heart of that regulatory regime have been the two key goals of (i) bringing the industry back from the financial disaster and physical decay that climaxed in the 1970s, while (ii) protecting the shipping public via ratemaking policies designed to reproduce the results of a workably competitive industry in settings where it is determined that unregulated market forces may not do so The road to recovery has been a long one No railroad has succeeded in achieving a rate of return on net investment, on a sustained basis, that has equaled or exceeded its cost of capital Thus, until the Board's recent change in its approach to calculating the railroads' cost of equity capital, the imprecision entailed by the use of net book value in revenue adequacy inquiries has had little practical consequence

With its decision to adopt CAPM as the method to be used in calculating the railroad cost of equity, while sticking with the historic book value approach to determining the value of assets to which that rate of return would be applied in revenue adequacy inquiries, the Board has significantly increased the chances that certain of the nation's railroads could at least *appear* to be earning a rate of return on net investment in excess of their cost of capital. The *appearance* of revenue adequacy under the current hybrid approach could well arise merely as a misleading artifact of the fundamental, "textbook" error of mixing market-driven measures of the cost of equity (such as CAPM or a multi-stage DCF) with historic accounting measures of net assets From the perspective of the public's interest, this error is dangerous, particularly in an industry with long-lived capital and with as much importance to the functioning of the nation's economy as the railroad sector Revenue adequacy determinations should be based on reality, not potentially misleading appearances. This argues for taking a new look at the feasibility of implementing the revenue adequacy test using an approach to asset measurement that is analytically consistent with the STB's calculation of the cost of capital

If there were going, competitive markets for all categories of railroad assets, and if all rail transportation services were sold in either workably competitive markets or under CMP ratemaking policies that could be guaranteed to reproduce the results of competitive markets as needed, current replacement costs for a given railroad's existing assets might be possible to determine But significant portions of rail service are regulated, rather than being provided in going competitive markets, and one of the goals of revenue adequacy determinations is to assess whether regulation – where it applies – is too "lenient" when measured against CMP standards Moreover, there are going, competitive markets for virtually *none* of a railroad's existing assets As a result, it is impossible to observe or reliably estimate current replacement costs for a railroad's existing assets at their existing age, in their existing configuration, and under current regulatory conditions The inability to overcome this problem was a major factor in the ICC's earlier decision *not* to base its revenue adequacy test on replacement costs

As we discuss below, however, the relevant economic principles establish that an appropriate annual revenue requirement can be developed by reference to the replacement costs *new* of the railroad's assets in their existing configuration, based on the Board's SSAC procedures [5] In other words, the DCF procedures used in the Board's SSAC framework allow us to calculate an annual revenue adequacy benchmark *revenue requirement* that is *consistent with* valuing a railroad's existing assets (at their current age and in their current configuration) at replacement costs under "just right" CMP regulation *without* actually having to calculate these replacement cost values for the assets By focusing its approach on the appropriate annual *revenue requirement*, the AAR proposal surmounts what has been, up to now, an intractable impediment to the use of replacement costs for revenue adequacy purposes.

In the remainder of this verified statement, we first reiterate the economic and regulatory principles that led the ICC *and* the RAPB to conclude years ago that use of current replacement costs was – as an economic matter – the "first best" approach to

[5] In using the terms "revenue requirement," "revenue adequacy threshold" or "revenue adequacy benchmark," we are referring to a benchmark "capital carrying charge" that would be compared to a given carrier's "actual modified net operating income" (Net Railway Operating Income, modified – as described by Mr Baranowski – to add back depreciation and tax expenses)

valuing assets for purposes of making annual revenue adequacy determinations In doing so, we emphasize how the principles that underlie the "modern finance practices"[6] cited by the Board in adopting CAPM also require that the annual revenue adequacy benchmark be consistent with valuation of assets at their replacement cost In the course of this discussion, we also explain that these principles of finance make it clear that the net book value of a railroad's assets is not a suitable substitute for current replacement costs

Second, we explain that the Board, itself, has provided the basis for feasibly and objectively estimating an annual revenue adequacy threshold consistent with replacement costs with its adoption of the Simplified Stand-Alone Cost ("SSAC") procedures in Ex Parte No 646 (Sub-No 1) We make two interrelated points here First, these procedures are consistent with the Board's competitive market standard of Constrained Market Pricing and the associated stand-alone cost criteria of "just right" railroad rates and revenues Second, these procedures address the practical impediments that the ICC cited, many years ago, in rejecting replacement costs as infeasible. In an accompanying verified statement, filed on behalf of AAR, Mr Michael Baranowski sets forth the specific calculations that form the basis of AAR's demonstration that use of replacement costs for revenue adequacy purposes is feasible in light of the SSAC framework.[7] He then applies the results of that methodology to the major US railroads for 2006.

[6] *Cost of Capital Methodology*, slip op at 4 (served August 20, 2007)

[7] As Mr Baranowski explains, the Ex Parte No 646 procedures employ certain "simplifying" assumptions that diverge from pure replacement costs In some of these cases, Mr Baranowski suggests modifications to the adopted procedures that would adhere more closely to the concept of replacement costs, in other cases, he suggests that the relatively small size of the investment amounts does not warrant at this time the extra effort that would be required to develop replacement costs, or he uses "placeholders" as temporary

III. THE FINANCIAL THEORY THAT UNDERLIES THE BOARD'S DECISION TO USE CAPM REQUIRES THAT CURRENT REPLACEMENT COSTS BE USED IN DETERMINING RAILROAD REVENUE ADEQUACY

A. The CAPM Rate of Return on Equity

The Board's adoption of CAPM explicitly invokes the returns that are required by investors in competitive capital markets[8] The basic CAPM formulation is

$R^* = R_F + \beta(R_M - R_I) + \varepsilon$, where

R^* = return required by equity investors,
R_I = risk-free rate of return,
R_M = rate of return on the overall market portfolio of equity investments,
β = a coefficient of systematic, non-diversifiable risk, and
ε = a random error term

The core premise of CAPM comes directly out of Nobel Prize-winning economics[9] demonstrating that, in order to attract and hold investors, capital markets adjust the price of equity (stock) in a firm or other asset so that the rate of return equity investors can reasonably expect to realize is comparable to the returns that competitive investments of

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substitutes for key assets requiring more extensive one-time efforts to develop replacement costs (in the case of land, for example) The minor departures from the Ex Parte No 646 procedures proposed by Mr Baranowski in no way detract from the two fundamental points of our verified statement, outlined above, *i e*, that current replacement cost is the appropriate value for the railroad's assets, and the Board's Ex Parte No 646 methodology provides a mechanism for feasibly implementing a current replacement cost approach Indeed, Mr Baranowski's treatment of land at its book value is extremely conservative in so far as competitive market pricing (under CMP SSAC principles) would properly recognize that railroads' use of land entails very high opportunity costs, particularly in urban areas These opportunity costs would be reflected in the productive value of land on which real-world owners would expect to earn their cost of capital, and would therefore be reflected in the annual revenues real-world owners would expect to earn from use of their land assets

[8] This same requirement has been *implicit* in the DCF approach previously relied upon by the Board and its predecessor, the ICC, in calculating the railroad cost of capital The rates of return to be targeted as "adequate" under a DCF approach are properly taken to be those derived under the assumption that adequate cash flows are those needed to ensure the sustainability of a railroad operating under competitive (CMP) conditions of "just right" regulation Adoption of CAPM, however, makes this requirement explicit

[9] See, particularly, the 1990 Nobel Prize in economics awarded to William Sharpe (http //nobelprize org/nobel_prizes/economics/laureates/1990/press html, accessed April 15, 2008)

comparable non-diversifiable risk (in the same industry or any other) are reasonably expected to generate This comparable return is the right-hand side of the equation above, which represents the returns available elsewhere in investments of comparable risk as consisting of (i) a risk-free rate (R_F, commonly represented by the returns available on the secured bonds of a stable and solvent government), plus (ii) the premium ($R_M - R_f$) that a portfolio of all equity investments available in the marketplace can be expected to return (R_M) over and above the risk-free rate, adjusted by a β factor measuring whether the stock in question has more ($\beta > 1$) or less ($\beta < 1$) non-diversifiable risk than the general stock market Finally, the random adjustment, ε, is introduced to reflect the fact that investors in the firm in question expect the CAPM formula to hold on average (*i e* , $\varepsilon = 0$ on average over time), but not necessarily at each and every moment in time

The CAPM formula captures the fact that if, over time and for a given stream of net income expected from a firm, the price of the firm's stock is so high that the rate of return implied by earning net income from investing in the firm's stock (*i e* , shares in the right to the firm's net income) is less than the rate of return expected from investing the same funds in other assets of comparable risk, equity investors will drive down the price of the firm's stock until the rate of return on holding shares in the firm is driven up to the level of the CAPM rate of return, R* At that point, investors' incentives to sell the stock in order to invest elsewhere – and the resulting downward pressure on the firm's stock price – stop Similarly, if a firm's revenues were expected to increase in the future, equity investors would be attracted to the stock They would bid its price up until the higher level of expected revenues would once again generate the CAPM rate of return on holding the stock These economics demonstrate why the CAPM rate of return measures the firm's *cost* of equity capital The firm must be able to present equity investors with at least the reasonable prospect that it will pay them the CAPM rate of return, R*, in order to attract and hold their capital [10]

At its heart, the revenue adequacy test is designed to ask whether a railroad earns revenues sufficient to generate a return on its investment at least equal to its cost of capital Railroad revenues might be inadequate, in part, because competition prevents railroads from earning revenues sufficient to remain in business over the long run But from the perspective of the STB's regulatory role, as to markets where competitive forces are not deemed to be effective, the revenue adequacy inquiry is tantamount to asking whether rate regulation is too permissive That is, is Board regulation functioning in these markets in a way that permits a railroad to earn revenues on a sustained basis substantially above those needed by a stand-alone railroad in a contestable market to cover all of its costs, including its cost of capital, over the long run?

The economic principles that underpin CAPM take the existing revenue stream as a given, and the economics of CAPM mean that the stock market value of the firm adjusts *in equilibrium until it yields the CAPM return investors require in the* marketplace This holds for both unregulated and regulated firms In the latter case, if regulation holds rates below competitive market levels, the current stock market value of the firm's assets will be pushed down to the point that investors in the firm earn the

[10] The firm's overall cost of capital is referred to as the "WACC" – the weighted average cost of debt and equity capital On the debt side, similar to equities, the value of a firm's debt will adjust such that the interest on the debt results in a rate of return for debt investors (creditors) that is comparable to what they can reasonably expect in investments of comparable risk

CAPM rate of return, and conversely if regulation were to permit railroads to charge rates in excess of competitive market levels In contrast, the revenue adequacy test is designed to assist in determining whether a railroad's overall revenues are adequate for it to replenish and sustain itself under competitive market conditions. The AAR's proposed approach explicitly and properly *declines to assume* that existing revenue levels are a given, and "just right" In so doing, it avoids the circularity inherent in measuring rates of return on the current stock market value of a railroad's assets,[11] while simultaneously avoiding the apples-to-oranges *non sequitur* of mixing market-measured CAPM rates of return with historic accounting measures of asset values

The appropriate measure of the value of the railroad's assets in a revenue adequacy inquiry is the value those assets would have if all of the markets a railroad operated in were workably competitive and the railroad earned revenues that would permit it to remain in business over the long run This is familiar territory for the Board, which knows how to properly calculate these required revenue levels – using the principles of contestable markets and CMP. By contrast, calculations based on the depreciated book value of already-sunk assets cannot provide the appropriate answer

[11] Noted regulatory economist, Alfred Kahn observes, in citing the propriety of using replacement costs instead of the actual stock market value of a regulated firm's assets, "[t]he current cost of duplicating the existing facilities or other capable of giving the same service does not move up or down so as to validate whatever level of rates and earnings are permitted" *The Economics of Regulation*, Volume I at 38

B. Comparing a Market-Based Rate of Return Measure, Such as CAPM, to a Railroad's Observed Rate of Return on the Historic, Depreciated Book Value of Its Assets Is Inconsistent with the Economic Underpinnings of CAPM

Consider the rate of return on a railroad that is realizing positive current net cash flows, but whose assets are substantially or fully depreciated Taking the ratio of positive net cash flow to the depreciated book value of the firm's assets implies that the railroad is generating extremely high rates of return In fact, for the railroad that is fully depreciated according to accounting measures of book cost, the railroad would appear to be generating a rate of return that is literally infinite (*i e*, any positive number divided by zero yields infinity).

Thinking about such an extreme case helps illustrate the fundamental flaws in using the depreciated book value of a firm's assets in a revenue adequacy inquiry. Should the railroad with an infinite rate of return (which obviously is a rate of return higher than its CAPM-based or any other cost of capital) have its rates set at no more than its raw out-of-pocket operating expenses? After all, any positive cash flow will generate an implied rate of return of infinity Clearly, this is nonsensical and implies regulation destined to kill the industry It is nonsensical because the public policy foundations of the revenue adequacy criterion are in seeking regulation that is neither too lenient nor too restrictive Indeed, the criterion was a direct product of the pre-Staggers regulation that turned out to be demonstrably too restrictive and drove the industry to the brink of collapse

The economic flaw in the foregoing lies in the fact that historic, depreciated book values do not necessarily reflect the productive value, *today*, of these assets in fully functioning markets in which regulation is neither too restrictive nor too lenient The productive value of a firm's assets in *today's* market reflects the relative ages of the assets to be sure (*i e* , how much of their respective economic lives remain), but also the cumulative effects of factors such as inflation, technological innovation, productivity improvements, and relative demand – all of which affect the ability of the assets to generate revenue, modified net operating income and cash flow for the firm, and *none* of which are reflected in net book values It is the productive value of a firm's assets *today* on which investors in competitive markets expect to earn a CAPM-based return [12]

To illustrate the economics, consider an owner-operator that owns a commercial truck that is fully depreciated in terms of the accounting, book value of its assets, but that still has a few years of productive life left in it Assume this trucker operates in a vibrantly competitive and growing truck transportation market Accordingly, the owner's still-productive truck earns revenues based on rates that are set by the competitive marketplace and in accord with its productive value to customers *today* Calculating the rate of return realized by the owner of the older truck based on the truck's fully

[12] Interestingly, both annual book depreciation *and* the economic depreciation implicit in the prices that would be forecast for workably competitive markets (*e g* , as embodied under SAC and SSAC analyses) implicitly assume that the productive value consumed each year of an asset's life is identical across all years The difference is that the accounting convention ignores the effect of the time value of money, while economic depreciation explicitly takes this effect into account Under economic depreciation, substantially more than half of the asset's productive value would remain when an asset reaches the mid-point of its economic life, and this fact would be reflected in a price for which it could be sold that would be substantially higher than half the price of a new asset (The value of a new asset with a 10-year life would equal the present value of the 10-year stream of earnings it would generate, when it is 5 years old, assuming a workably competitive market, it would be able to be sold for a price equal to the present value of a *5-year* stream of the same annual level of earnings, and the present value of earnings for 5 years is more than half the present value of the same level of earnings for 10 years) Thus, the remaining productive value of a used asset – all other things being equal – is always higher than the ratio of remaining life to full economic life that is assumed for the purposes of book accounting Inflation in the cost of acquiring new assets and/or increases in the demand for these assets can push up the productive value of used assets even further

depreciated asset value of zero implies that the owner earns an infinite rate of return Yet, this view is grossly misleading The capital that the owner-operator has tied up in the truck is not zero. Instead, it has a value equal to what the truck would generate for its owner if it were sold, and the owner could then redeploy the proceeds into other investment opportunities of comparable risk

Of course, the productive value of the truck in this example is driven by the present value of the future net cash flows it is expected to generate in its competitive marketplace, and the future cash flows it can generate are in turn driven by the rates its competitors are charging, including competitors that are entering the market today with new trucks in order to satisfy the needs for additional truck capacity in a growing market As the principles of CMP teach us, these competitive rates will be *SAC* rates – *i e* , rates sufficient to cover the stand-alone costs of the new trucks brought to market Suppose, for purposes of illustration, that these SAC rates result in revenues of $1000 per year. With new and older trucks' revenues set at this level by competition, to be sure, the owner-operator with the older truck will have a truck that is worth less than new trucks After all, the older truck has fewer years left over which to earn SAC, competitive rates and revenues Nevertheless, we can measure the annual revenues that the older truck in the competitive trucking market can earn *and that would be adequate to incent the owner to invest and replace it when it dies*, as the annual revenue requirement of the stand-alone *replacement cost new* truck There is no need to calculate the asset value of the older truck directly

Note, that in the foregoing illustration, if a regulator were to restrict the rates charged by the owner-operator of a fully-depreciated, but still useful truck to below competitive market prices and revenues, the owner would face depression in the value of the truck, and the owner would have every incentive to withdraw his capital (by selling the truck, refusing to reinvest in upkeep, or some combination of these two) The "too strict" regulated revenues would be inadequate to induce the owner to remain in business over the long run, even if the owner keeps the truck in business and continues to make investments (*e g* , in oil changes) as the truck limps toward its demise [13] Moreover, if the truck were sold, the new owners of a truck subject to below-competitive-market regulated rates would find themselves able to earn their required CAPM rate of return only by foregoing the investments needed to keep up the quality of the service provided by the truck, and instead letting the truck deteriorate (just as in the case of the pre-Staggers deterioration of Class I railroads)

As this example illustrates, net depreciated book values are an inherently flawed measure of the productive value of a firm's assets (*i e* , the value of capital that investors have committed to the assets), particularly for long-lived assets in markets that are stable (the revenue adequacy presumption) or growing Any commonly-used schedule of depreciation (such as those used for regulatory or tax accounting purposes) cannot realistically anticipate or track the actual evolution of the myriad market conditions that

[13] In fact, if there were no barriers to entry and exit and the hypothetical owner-operator could pick up and move his truck to a jurisdiction with competitive prices (either emanating from competitive markets, or from "just right" regulation of not-workably competitive trucking markets), he would do so The implication for the railroad industry, with its obvious barriers to picking up and moving assets and operations to another jurisdiction, is that "too restrictive" regulation will be met with "limp along" investment and gradual decay and exit via failure to replenish for the long run

determine the amount of capital that investors have tied up in a firm at each evolving stage of its existence

C. The Replacement Cost of the Firm's Assets Is the Appropriate Standard To Be Used in Assessing Revenue Adequacy

The economic principles outlined in the discussion above clearly apply to the long-lived assets owned by the nation's railroads Indeed, the industry's rejuvenation since passage of the Staggers Rail Act and, as a consequence, its ability to play a strong contributing role in the country's expanding and increasingly globalized economy clearly place a premium on ensuring its ongoing financial health This makes it all the more important that investors in the nation's railroads earn revenues that yield incentives to continue to retain, maintain and replace railroad assets To maintain these incentives, the revenue adequacy benchmark must be developed in a manner that permits investors in the railroad industry to earn a CAPM-based return on an investment base valued in a way that reflects the current productive value of the railroad's assets *under the necessary and proper assumption that the firm's revenues are consistent with competitive markets for the firm's output*

An investment base determined according to accounting principles – that, by design, do not reflect the cumulative effects of inflation, technological innovation, and productivity improvements on the productive value of the firm's long-lived assets – does not, and cannot, satisfy this criterion Instead, the current productive value of a firm's assets is properly measured by the net present value of the net cash flows that those assets would generate when railroad services are priced in the aggregate consistent with competitive CMP (SAC and SSAC) criteria These criteria of CMP pricing, in turn, lead directly to recognition that CMP pricing is the pricing that just covers replacement cost In the case of an existing railroad, the replacement cost of its assets, with asset lives shorter than the asset lives of a new stand-alone railroad, is properly recognized as the net present value of the stream of annual revenue requirements that would have to be earned over its shorter years of remaining service to yield incentives to continuously maintain and replace rail assets On an annual basis, these are the revenues that enable a competitive, stand-alone railroad to survive

As stressed, these economics are consistent with sound regulatory policy because earning a market-based (*i e*, a CAPM-based) rate of return on the current replacement costs of the firm's assets permits a return of the initial investment and replacement of the assets when their productive lives are exhausted that is consistent – each and every year – with the competitive market standard Without earnings at these levels over the long run, investors will not be willing to continue to tie up their capital in retaining efficient and competitive railroads in service over the long-run. Instead, investments will go un-maintained and un-replenished to the levels demanded of a healthy, growing industry In the process, service quality and/or quantity will diminish relative to what is demanded by railroad customers [14]

[14] While it is true that over the economic life of an asset, a series of annual returns calculated on the basis of annual book depreciation *plus* a CAPM-based return on the undepreciated net book investment would generate adequate revenues, those returns would overstate the level of annual revenues that would be achievable in a stable competitive market in the early years of an asset's life, and understate the level of annual revenues that would be achievable in a stable competitive market in the latter years of an asset's life In other words, revenues that are entirely consistent with stable competitive markets would be found, under the Board's current procedures, to be "inadequate" in the early years of an asset's life, and would be found to be far above "adequate" in the latter years of an asset's life (*see* Exhibit No __ (Kalt/Klick-5) and discussion, below, of this exhibit) In part, this is because the "book value" approach to calculating the level of revenues required each year (i) overstates the loss of productive value (*i e*, annual depreciation) each year in the early years of an asset's life, and (ii) delays recognition of the effects that inflation,

The appropriateness of using current replacement cost as the basis for calculating the annual revenues that investors require in order to earn their cost of capital on their investments is a widely-accepted concept in economics and in regulation. It is basic economics that this is the most conceptually-correct approach, particularly in the context of a viable and growing industry with assets that are long-lived (as is the case with the railroad industry) Importantly, both the ICC and the RAPB reached this same conclusion [15]

In short, there is widespread recognition that use of current replacement costs is appropriate in circumstances like the Board's revenue adequacy test The goal of such a test is to help us avoid regulation that is either too lenient or too restrictive in sectors where regulation exists to address concerns that unregulated competition may not be fully effective in serving the public interest Establishing an annual revenue adequacy benchmark consistent with valuing assets at their current replacement cost promises to harmonize the revenue adequacy test with the Board's goals of promoting competitive outcomes in railroad markets

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technological innovation and productivity improvements have on the value of the *existing* assets (*i e*, it understates the amount for which the assets could be sold at any point after they go into service) until they are actually replaced – a cycle of undervaluation that repeats itself in the next and subsequent rounds of asset replacement

[15] The ICC found that "the revenue requirements inferred by using replacement costs are more closely aligned with the investment returns required in a competitive market" *Standards for Railroad Revenue Adequacy*, 3 I C C 2d at 276 (note emphasis on revenue requirements in this quotation) Similarly, the RAPB noted that "[t]he argument for current market value valuation is that this methodology is consistent with economic principles which value assets in terms of opportunity cost In most cases, opportunity cost is measured by the replacement costs of assets with similar remaining productive lives and capacity" *Railroad Accounting Principles, Final Report* at 60 As we noted at the outset of this Verified Statement, the Board's SSAC-based procedures allow us to develop a replacement cost-based annual "revenue requirement" (to use the ICC's term) *without* actually having to undertake the arduous (at best) task of developing "the replacement costs of assets with similar remaining productive lives and capacity" described by the RAPB We demonstrate how this works, below

The objections to use of current replacement cost have focused on its feasibility, not its conceptual validity As we explain in the next section, however, recent decisions by the Board address the principal objections to feasibility As a result, there is no longer a significant impediment to the STB's adoption of current replacement cost value for assets in making its revenue adequacy determinations each year

IV. THE BOARD'S SSAC PROCEDURES PERMIT ASSESSMENT OF REVENUE ADEQUACY IN A MANNER THAT REFLECTS THE WAY COMPETITIVE MARKETS WOULD VALUE RAILROAD ASSETS

To this point, we have stressed that to avoid the "apples-to-oranges" error of mixing market-derived CAPM rates of return with non-market-driven accounting book asset values, it is proper to measure the value of the railroad's assets at the values they would exhibit (i) if there were real-world competitive markets for all of a railroad's assets, new and used, and (ii) under the presumption that rate regulation is "just right," *i e*, that it yields year-by-year revenues that are neither higher nor lower, over the long run, than fully competitive rail markets would yield This, of course, is precisely the concept that underlies the Board's long-standing Constrained Market Pricing ("CMP") principles and, in particular, the Stand-Alone Cost ("SAC") constraint imposed by CMP In its recent decision in Ex Parte No 646, the Board adopted Simplified SAC ("SSAC") procedures as a replacement cost standard that can be more easily implemented under CMP policies, and these procedures permit the Board to assess revenue adequacy in a manner that is consistent with competitive market principles and contestability.

Moreover, the Board's DCF model – which is at the heart of both the SAC and SSAC procedures – provides an eminently appropriate and feasible vehicle for implementing a revenue adequacy test employing replacement cost measures of railroad asset values that are consistent with the way competitive markets would value those assets Using precepts and inputs emanating from the SSAC framework, the Board's DCF model can readily determine the economic costs that must be recovered for a carrier to be viable over the long run in competitive (*i e*, contestable) markets Using SSAC procedures to assess revenue adequacy will allow the Board to apply a unified economic theory to two of its most important regulatory missions – rate regulation and revenue adequacy determinations

A. Overview: Implementing a Unified Approach to Rate Regulation and Revenue Adequacy

Let us now turn to illustration of a unified approach to rate regulation and revenue adequacy. The essence of the approach is contained in the economics of the example above of the fully-depreciated truck operating in a competitive market of many trucking firms Although it has a depreciated book value and fewer years of useful life left in it than a new truck, the annual revenues (rates) an already-built truck can charge in a competitive, going marketplace for truck transportation are determined by the annual revenues that are needed to support the purchase – the stand-alone cost – of new trucks

If rates fall below this level, the supply of new trucks, and the replacement of existing truck capacity, is discouraged The pressure of growing demand on limited supply then implies upward pressure on trucking rates until they reach the level at which new supply can afford to enter the market If rates rise above this level, additional supply of new trucks will be attracted, putting downward pressure on rates until the point is reached at which new supply can just cover its stand-alone costs All the while, the already-built supply of trucks captures the resulting competitive rates in the marketplace, regardless of what some accounting convention says about the book value of these already-built trucks These rates create revenues that generate the rates of return that are adequate to attract the new investment that is needed to satisfy a growing market and to replace older trucks as they are retired from service

Indeed, these are just the familiar economics undergirding the Board's principles of Constrained Market Pricing The important implication for revenue adequacy determinations is that the value of older trucks is directly derivable from the net present value of their remaining years of competitive, "just right" revenues With fewer years of service and associated revenues left in them, older depreciated trucks are worth less in total (*i e* , have a lower productive value) than new trucks, but they generate the same annual revenues, when properly maintained, as do new trucks in each year in which they are in service

Thus, we can calculate the annual revenues that an older truck would earn in any given year by calculating what investors in *new* trucks would have to charge that year in order to earn their cost of capital on the cost of purchasing a comparable *new* truck (assuming, of course, that the older truck can provide the same quality of service as the new one This holds even though a new truck would have a higher value (by virtue of its longer expected life) than an older truck (with a shorter remaining life). The older truck earns annual revenues driven by the SAC-based competitive prices These revenues represent the amount the owner of the old truck would need to receive in order to earn his cost of capital on the productive value of the old truck, and to replace the truck at the end of its useful life.

In the same way, the cost of constructing a *new* railroad (*i e*, the stand-alone, replacement cost new of a new railroad) can be used to derive the annual revenue requirement that an *existing* railroad would need to achieve for its investors to earn their cost of capital on the *current productive value* of their used assets in any given year. This eliminates the need, in the revenue adequacy context, to estimate the current value of a railroad comprised of assets that are not new (which, as we discuss below, is likely an insurmountable problem) – the annual revenue adequacy benchmark can instead be developed by starting with the replacement cost new of the railroad's assets

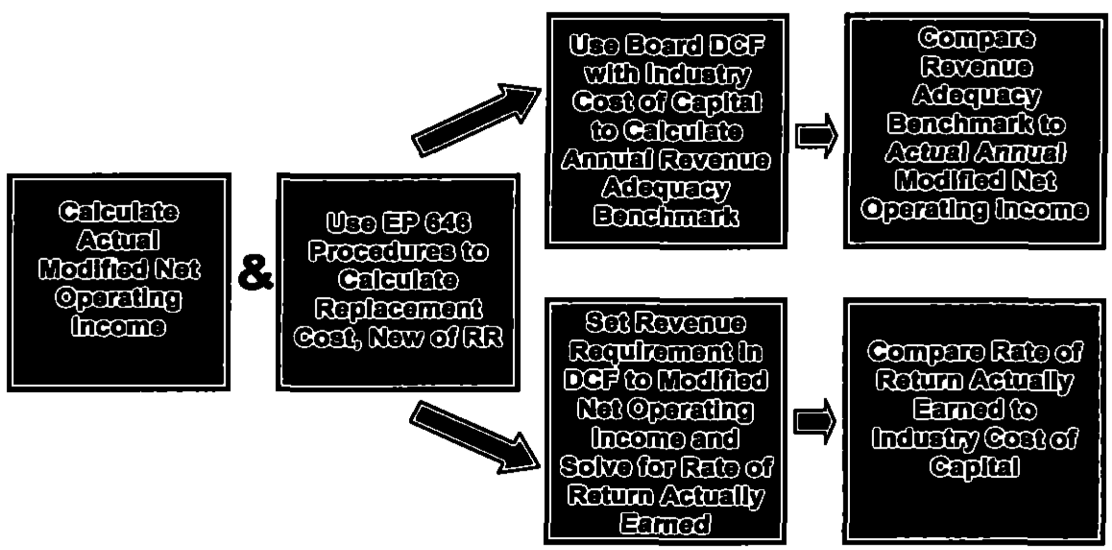
As we have stressed, these principles are, in fact, quite familiar under the Board's standards of Constrained Market Pricing. The SAC, and now SSAC, methodology and standards proceed by asking what revenue requirement would be sufficient to yield investors recovery of their cost of capital and induce investors, not subject to any barriers to entry or exit, to keep committing their capital to the railroad industry. Providing actual railroads with any less return on the grounds that they have already sunk their capital and barriers to exit prevent them from pulling it out of the industry would only discourage adequate investment over the long run [16] In short, the revenues that are adequate to sustain investment in the rail industry over the long-run are those that would yield a stand-alone railroad a rate of return no less than the railroad cost of capital. For equity investors, this cost is the CAPM rate of return

[16] See note 13 and accompanying discussion above

Conceptually, the implications for an economically coherent revenue adequacy test that employs CAPM rates of return are straightforward We illustrate the basics of the approach in the flowchart of Figure 1 The process can be represented along two economically equivalent paths. The process begins with (i) the calculation of actual modified net operating income for a given railroad and (ii) the calculation of the stand-alone, replacement cost of the railroad new using a methodology based on the Board's SSAC procedures These serve as key inputs to the testing of revenue adequacy Along the upper path in Figure 1, the stand-alone, replacement cost, new of the railroad is subjected to the DCF analysis, using the Board-determined industry cost of capital This results in an annualized revenue requirement of the railroad (analogous to the revenue

Figure 1

Implementation of the Proposed SSAC-Based Measure of Revenue Adequacy



requirement of competitively-priced truck service in the example discussed above) The revenue adequacy of the railroad is then tested by comparing this annual revenue requirement to the actual annual modified net operating income of the railroad

Along the lower path in Figure 1, the foregoing economics are illustrated in terms of rates of return Here, the railroad's actual modified net operating income is input into the DCF analysis as the "revenue requirement" and the DCF is employed to solve for the actual rate of return being earned by the railroad on the replacement cost of its assets (as derived under the SSAC procedures) This actual rate of return on the railroad's assets is then tested for its adequacy by comparing it to the Board-determined industry cost of capital

Note that, while a revenue adequacy test is performed annually, it would not be appropriate to conclude that, for example, a single year of modified net operating income that exceeds the annual revenue requirement generated by SSAC (or, equivalently, one year of an actual rate of return on the replacement cost value of assets in excess of the industry cost of capital) establishes that regulation is too lenient and is allowing a railroad to charge above-competitive rates in the aggregate At any point in time, actual annual modified net operating income and calculated rates of return emanating from the process described in Figure 1 may exceed or fall short of the steady-state results emanating from application of SSAC procedures for calculating revenue requirements and rates of return. Such variations in actual results can be expected from vacillations in such factors as a railroad's input costs and economic trends in a railroad's market regions and services Indeed, railroad modified net operating incomes have historically been highly correlated with peaks and troughs of the business cycle The fact that modified net operating income might exceed the revenue adequacy level during, say, the peak of the business cycle could well be offset by modified net operating income below revenue adequate levels during the non-peak periods. As applied under a regulatory revenue adequacy test, this means that judgments regarding whether regulation is too lenient or too strict can only properly be drawn by observing the results of revenue adequacy testing over a period of years encompassing, for example, complete business cycles

B. Although the DCF Model Used in SSAC Does Not Replicate the Board's Current Revenue Adequacy Algorithm, It Answers the Same Questions

The Board's current revenue adequacy formulation asks whether the Net Railway Operating Income earned by a railroad in a given year generates a return on net investment that equals or exceeds the railroad industry cost of capital, the DCF methodology, as applied in SSAC, seeks to determine a revenue requirement each year that *just* generates a rate of return on investment, over the life of the railroad's assets, equal to the cost of capital, and compares that "SSAC revenue requirement" to the actual modified net operating income earned Functionally, these two perspectives are equivalent If actual modified net operating income exceeds the SSAC revenue requirement, it will also generate a rate of return in excess of the railroad industry cost of capital (the Board's current formulation); if actual modified net operating income is *below* the SSAC revenue requirement, it will also generate a rate of return below the railroad industry cost of capital Consistent with this equivalency, Mr Baranowski demonstrates how the SSAC results can be expressed in terms of a rate of return on investment that can be compared to the railroad industry cost of capital.

C. Use of the SSAC Framework for Assessing Revenue Adequacy Addresses the Principal Implementation Concerns Previously Identified by the ICC

In deciding not to utilize current replacement costs in revenue adequacy determinations, the ICC and the RAPB – to which the ICC looked for guidance on this issue – focused on both implementation problems that it felt made use of current replacement costs infeasible for revenue adequacy determinations, and on the potential lack of objectivity in relying on railroad-generated estimates of the current replacement costs of a railroad's assets Implementation concerns included (i) the difficulty of determining vintages for various asset categories, which made estimating current market value difficult, (ii) the complexity of assessing how technological obsolescence and improvements in productivity would affect the current market value of these used assets in any given year; and (iii) the practical difficulties of solving these two problems each year for each of the Class I railroads. The ICC's concern over the "objectivity" of railroad-generated estimates was related to these feasibility concerns Even if a mechanism could be developed to estimate current replacement costs, there was concern that the data needed to do so would be largely in the control of the railroads. This was seen as making it difficult for the regulatory agency and shippers to assess feasibly the reliability of any current replacement cost estimate that would result In addition, the Board recently observed that if revenue adequacy were based upon some form of replacement cost valuation of assets, a real cost of capital would have to be used [17] As we discuss below, use of the Board's SSAC DCF framework straightforwardly addresses these concerns

[17] *Cost of Capital Methodology, slip op* at 9 (served August 20, 2007)

The ICC's reservations about current replacement costs reflected the view that efforts to calculate the current replacement cost of currently held assets at their current age and configuration each year would present intractable problems. Conceptually, one could contemplate indexing depreciated net book values to current levels, but issues such as (i) developing vintages for every group of assets in every category of investment each year for each railroad, and (ii) finding or developing appropriate indexes for each category of investment would be difficult, and (iii) even if one could solve (i) and (ii), creating a methodology to practically adjust these results for the effects of technological obsolescence and changes in productivity would make use of indexed replacement costs extremely difficult.

As an economic matter, however, these difficulties can be overcome by using the replacement cost of *new* assets to estimate the level of adequate revenues required in any given year – as long as the productive value of the assets is assumed to be identical in each year of their economic life, *i e*, as long as a 10-year old stretch of track is as productive as a brand new piece of identical track in the same location; and a 10-year old freight car can provide the same level of service in a given movement as a new freight car of the same capacity It is precisely this assumption that underlies the DCF analysis used by the Board in its SAC and SSAC methodologies, and this same assumption can be used to assess revenue adequacy in any given year *without* having to develop current replacement costs for used facilities and equipment [18]

[18] The assumption implicit in the Board's SSAC DCF that productivity is equal each year of an asset's life is consistent with comparing the SSAC-determined revenue adequacy benchmark to railroad revenues that are net of operating expenses, including maintenance Because railroad asset bases reflect a mix of assets

SSAC yields these results because, as we have discussed above, the Board's DCF analysis incorporates economic depreciation, which equates depreciation in any given year to the decline in the remaining productive value of the asset experienced in that year, and makes the simplifying – but not unreasonable – assumption that the revenue generating ability of an asset is the same in each year of its life, *regardless of its age* The annual "revenue requirement" developed in the DCF, using economic depreciation, compensates the investor for the decline in the present value of the future productive value that occurs each year of an asset's life (the return *of* capital, or depreciation), and it provides a return on the undepreciated portion of the asset's value, which is the present value of the *remaining* future productive value (the return *on* capital) The sum of these two amounts is the same, regardless of whether the asset is brand new, or one year from the end of its economic life.

The RAPB recognized this feature of the DCF used in the SAC and SSAC procedures in its *Final Report*·

> Under the utility method, capital costs are determined each year by multiplying the net depreciated asset base times a cost-of-capital rate and adding to this figure an annual depreciation expense (usually based on straight-line depreciation).
>
> Under the DCF method, also called a capital budgeting approach, a profitable investment or venture must produce cash flows which, when discounted at the cost-of-capital rate, equal or exceed the initial cash outlay When used for maximum rate purposes, the cumulative present value of cash flows must equal the hypothetical competitor's

that runs from brand new assets to those near the end of their economic lives, annual operating expenses for maintenance of road and equipment are a presumptively reasonable estimate – in today's dollars – of the normalized maintenance that would be required to maintain normal productivity across the economic lives of a carrier's assets

> initial cash outlay since returns in excess of the cost of capital are not permitted
>
> * * *
>
> Assuming that rates are based on costs, the time pattern of capital recovery will differ between alternative approaches The time pattern under the utility approach is one of high capital costs in an asset's early years and relatively low capital costs in its later years The time pattern under the DCF approach depends on the productivity of an asset over time. If the productivity of an asset is constant over its life, the DCF approach produces a level annuity, if the productivity declines evenly over time, the DCF approach may conform more closely with the utility approach
>
> The difference between the two approaches is illustrated by considering two railroads, one with entirely new assets and one with the same type of assets comprised of mixed vintages and valued at current market cost Under the utility approach, the railroad with entirely new assets will exhibit higher capital costs in the first year than the railroad with mixed assets. Under the DCF approach, if the productivity of the assets for both railroads is constant over their entire lives, other things being equal (such as tax depreciation), both railroads would have the same capital costs *In the DCF case, relative vintages of the railroads' assets are immaterial* RAPB *Final Report* at 67-68 (emphasis added)

The Board's DCF procedures also address its concerns about use of real versus nominal costs of capital when replacement costs are used The DCF procedures start with the current cost of constructing the railroad each year, and constrain whatever starting revenue requirement is solved for such that it increases solely with the effects of inflation each year. As a result, the Board's DCF effectively solves for a "real annuity" This is mathematically the equivalent to calculating the starting revenue requirement using the real cost of capital We demonstrate below that the Year 1 revenue adequacy benchmark that results from applying the Board's DCF procedures is consistent with a "real annuity" developed using the real cost of capital (*see* Exhibit No ___(Kalt/Klick-6))

D. Illustrative Examples Illustrate These Principles

Attached, as Exhibit Nos ___ (Kalt/Klick-3), ___ (Kalt/Klick-4), ___ (Kalt/Klick-5). and ___ (Kalt/Klick-6) are four DCF comparisons that illustrate these principles analytically These are not as sophisticated as the SSAC DCF analyses employed by the Board (*e g* , they assume a single economic life for all assets, and they ignore the effects of income taxes), but like the Board's DCF, they solve for a starting revenue requirement that is increased each year by the anticipated rate of inflation in the cost of constructing the stand-alone railroad As such, they are useful in illustrating the principles that we have discussed above

On the left side of Exhibit No 3, we have displayed the DCF for a new asset purchased for $100,000,000 with a 20 year life, showing the annual revenue requirement under the assumptions reflected at the top of this spreadsheet These annual revenue requirements *just* permit the investor to earn a rate of return equal to its cost of capital over the life of the asset On the right side of Exhibit No 3, we show how these annual revenue requirements would compare, in years 6 through 20 of the first asset's life, with those required by a *new* asset bought 5 years later for a price equal to the original $100,000,000 increased by the cumulative effects of 3% rate of inflation each year for 5 years.

Assuming that the asset owner is just earning its cost of capital, you can see that for all years in which the economic lives of the two new assets of different ages overlap, the annual revenue requirement needed to be revenue adequate is identical in each and every year

This principle would continue to apply into perpetuity as each column of assets is replaced In Exhibit 3A, we have extended the left side of the illustration by providing for replacement of the first asset at the end of Year 20 for a price of $180,611,123 (the original $100,000,000 multiplied by the cumulative effects of 3% inflation for 20 years) Exhibit 3A demonstrates that in Year 23, for example, the same revenue requirement continues to be calculated for both assets

In Exhibit No 4, we have made a similar showing, except this time we buy a used asset instead of a new asset 5 years later Assuming that the asset owner is *just* earning its cost of capital, a used asset could be purchased in Year 5 for the present value (at the railroad cost of capital) of the future stream of annual earnings required *just* to permit the investor in that asset to recover its investment in the used asset over the 15 years of its remaining economic life And not surprisingly, this generates the same annual revenue requirements as are needed for each of those 15 years by the investor who bought a new asset 5 years before. Furthermore, when these assets are replaced at the end of Year 20 with in-kind assets, the replacement assets *also* generate identical revenue requirements in each year

What Exhibits Nos 3 and 4 illustrate is that whether an asset is new or used, it generates the same annual revenue requirement in any given year [19] This means that in applying the SSAC DCT for revenue adequacy purposes, there is no need to engage in the herculean task of trying to determine the current replacement costs of used assets in order

[19] *Of course, as noted above in the case of the used truck, used assets have lower market prices than new* assets, because their economic life is shorter But for the years in which they would both be in service, they need to earn the same annual revenue in order for investors to earn their cost of capital

to implement a revenue adequacy test using replacement costs Instead, the SSAC DCF procedures – assuming all assets are new, and recovering their investment costs over the full economic lives of these assets – give us the appropriate annual revenue adequacy benchmark, regardless of the vintage of an individual railroad's assets

Exhibit No ___ (Kalt/Klick-5) demonstrates that the revenue requirement calculated using the SSAC DCF methodology generates a rate of return equal to the cost of capital *in each and every year* of the asset's life Using the DCF-determined annual revenue requirements, it also calculates what the Board's current depreciated book value based revenue adequacy algorithm would calculate as the rate of return each year [20] In the earlier years of the asset's life, the book value methodology shows rates of return well below the cost of capital, and in the later years of the asset's life, it shows rates of return well above the cost of capital Importantly, at the "half life" of the asset, the book value methodology currently relied upon by the Board would suggest that the asset is earning too much, even though it is earning revenues just sufficient to exist over the long run In short, another advantage of the SSAC DCF-based methodology for assessing revenue adequacy is that it gives a substantially more reliable picture of long-run revenue adequacy in any given year, regardless of the relative vintage of a rail carrier's assets.

Finally, as we noted earlier, either a real or nominal cost of capital can be used with a DCF approach, depending on the nature of the cash flows being discounted, to

[20] The Board's DCF calculates – by design – annual revenue requirements each year that are consistent with what one would expect to observe over the long run in a competitive market Thus, they represent the revenues a rail carrier would earn each year if all rail markets were fully competitive Significantly higher annual revenues could not be earned consistently without attracting entry of an efficient competitor, which would then drive rates to these levels

generate the identical Year 1 revenue requirement needed for revenue adequacy The Board's SSAC DCF uses the nominal cost of capital in developing the annual SSAC revenue requirement This is appropriate, since the revenue requirement is assumed to inflate each year (including in Year 1) at the rate of inflation anticipated in railroad construction costs (*i e*, the cash flows are *nominal* cash flows). This means that the "Year 0" revenue requirement should be the same, whether a nominal or real cost of capital is employed in the DCF.[21] Exhibit No ___ (Kalt/Klick-6) uses the same assumptions as Exhibits 3, 4 and 5, and shows that the annual revenue requirement that is calculated by using the Board's DCF procedure and a *real* cost of capital -- $9,290,238 – is identical to the "Year 0" revenue requirement reflected in Exhibits 3, 4 and 5 (which, consistent with the Board's DCF, reflect nominal annual revenue requirements calculated by increasing the $9,290,238 figure by 3% each year)[22] The fact that the "Year 0" revenue requirements are identical in all four exhibits demonstrates that the Board's DCF procedure does not double-count the effects of inflation in developing the annual revenue adequacy benchmark

[21] Consistent with the mathematics of the Board's DCF, Exhibit No 6 calculates the real cost of capital as

$$\text{Real Cost of Capital} = \left[\frac{(1 + \text{nominal COC})}{(1 + \text{inflation rate})}\right] - 1$$

Under this formulation, the annual revenue requirements calculated by a DCF analysis using the real cost of capital is the Year 0 revenue requirement "Year 0" is a mathematical convention that describes the state of play at the end of the year prior to the first year of the analysis (Year 1) The revenue requirement in Year 0 must be increased by the cumulative effects of inflation each year in order to correspond to the annual *nominal* revenue requirements that are calculated in the Board's DCF The use of the *nominal* revenue requirement produced by the Board's DCF is necessary in order to create an "apples-to-apples" comparison with each year's actual modified net operating income (which is obviously in nominal dollars)

[22] The Year 1 revenue requirement of $9,568,945 shown in Exhibits 3, 4 and 5, divided by 1 03 yields the $9,290,238 figure shown on the right side of Exhibit 6, which is generated by using the real cost of capital in the DCF

We are now in a position to see why the Board's SSAC procedures address the major impediments cited by the ICC in deciding not to incorporate current replacement costs into the revenue adequacy test, even though it recognized that this would be superior from an economic perspective. First, it eliminates the need to determine vintages for all of the railroad's assets in each category of investment Second, by relying upon current costs *new* of state-of-the-art assets and construction techniques, it automatically reflects the current state of technological innovation and productivity, thereby addressing a second impediment the ICC identified Third, by developing a set of assumptions from prior full SAC cases – in which the opposing parties have engaged in substantial discovery and litigated the appropriate replacement cost inputs – the Board's Ex Parte No 646 procedures effectively address the ICC's prior concerns about "objectivity" Finally, the Board's DCF employs a nominal cost of capital in a way that ensures that the effects of inflation are not double-counted when the assets are valued at replacement cost

As a result, SSAC procedures that can be used to realistically estimate replacement costs new, for the purposes of rate cases, also make it feasible to (i) calculate replacement costs new for each of the railroads in each year, and (ii) develop an annual revenue adequacy benchmark that properly reflects the current replacement costs of a railroad's assets, regardless of vintage. Calculations illustrating this approach (for 2006) are set forth in Mr. Baranowski's Verified Statement

I declare under penalty of perjury that the foregoing is true and correct   I further certify that I am qualified and authorized to sponsor and file this testimony

Executed on April 30, 2008

Joseph P Kalt, PhD

I declare under penalty of perjury that the foregoing is true and correct. I further certify that I am qualified and authorized to sponsor and file this testimony

Executed on April 30, 2008

John C Klick

1

Exhibit No ___(Kalt/Klick-1)

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SELECTED PRESENTATIONS

Keynote Address "Resurgence and Renaissance in Indian America," Native American Business Association Annual Convention, Mississippi Choctaw Nation, April 29, 2008

"Standard Oil to Today Antitrust Enforcement in the Oil Industry," American Bar Association, 56th Antitrust Law Spring Meeting, Washington, D C , March 27, 2008

Keynote Address· "Nation Building: Lessons from Indian Country," National Native American Economic Policy Statement, Phoenix, AZ, May 15, 2007

Keynote Address· "A Conversation on the State of the Native Nations A Gathering of Leaders," Res 2007, Las Vegas, NV, March 14, 2007.

"Foundations of Nation Building. The Roles of Culture, Institutions, & Leadership Among Contemporary American Indian Nations," a lecture to faculty, staff and students, Marine Corps University, Quantico, VA, March 12, 2007

Keynote Address· "The Universal Challenge of Nation Building," First Annual Great Lakes Tribal Economic Development Symposium, Traverse City, MI, October 25-26, 2006

Transcript of Keynote Address, "Setting the Agenda What Will Drive Energy's Future?" *Congressional Quarterly Forum*, "The Politics of Oil U S Imperatives, Foreign Consequences," Washington, D.C , September 13, 2005.

"The Role of the Tribal Courts and Economic Development," Bureau of Indian Affairs *Tribal Courts in the 21st Century*, Billings, MT, August 16, 2005.

"Linking Tribal Sovereignty to Economic Self-Determination in Indian Country," *The Tribal Leaders Forum*, "Sovereignty in Crisis," Las Vegas, NV, May 27, 2005

"Competition and Regulation in the North American Electricity Industry Can These Two Seemingly Opposed Forces Coexist?" (with Charles Augustine and Joseph Cavicchi), 24th Annual North American Conference, USAEE/IAEE, Energy, Environment, and Economics in a New Era, Washington, DC, July 8-10, 2004

"The State of U S Railroads and the Challenges Ahead," briefing of Capitol Hill staff, Association of American Railroads, April 17, 2003.

"The State of the Railroad Industry and the Challenges Ahead," briefing of Roger Nober, Chairman, US Surface Transportation Board, Association of American Railroads, January 28, 2003

"The Wealth of American Indian Nations Culture and Institutions," Federal Reserve Bank of Boston, December 11, 2002

"The Roots of California's Energy Crisis Law, Policy, Politics, and Economics," Regulation Seminar, Center for Business and Government, Kennedy School, Harvard University, November 7, 2002

"Public Policy Foundations of Nation Building in Indian Country," National Symposium on Legal Foundations of American Indian Self-Governance," Mashantucket Pequot Nation, February 9, 2001

"Twenty-Five Years of Self-Determination Lessons from the Harvard Project on American Indian Economic Development," Udall Center for Studies in Public Policy, University of Arizona, November 13-14, 1999

Proceedings of the Fourth Annual DOE-NARUC Natural Gas Conference, Orlando, FL, February 1995

Keynote Address, "Sovereignty and American Indian Economic Development," Arizona Town Hall, Grand Canyon, AZ, October 1994.

"Is the Movement Toward a Less-Regulated, More Competitive LDC Sector Inexorable?, (Re)Inventing State/Federal Partnerships· Policies for Optimal Gas Use," U S Department of Energy and The National Association of Regulatory Utility Commissioners Annual Conference, Nashville, TN, February 1994.

"Cultural Evolution and Constitutional Public Choice: Institutional Diversity and Economic Performance on American Indian Reservations," Festschrift in Honor of Armen A. Alchian, Western Economic Association, Vancouver, BC, July 1994

"Precedent and Legal Argument in U S Trade Policy Do they Matter to the Political Economy of the Lumber Dispute?" National Bureau of Economic Research, Conference on Political Economy of Trade Protection, February, September 1994.

"The Redesign of Rate Structures and Capacity Auctioning in the Natural Gas Pipeline Industry," Natural Gas Supply Association, Houston, TX, March 1988.

"Property Rights and American Indian Economic Development," Pacific Research Institute Conference, Alexandria, VA, May 1987

"The Development of Private Property Markets in Wilderness Recreation An Assessment of the Policy of Self-Determination by American Indians," Political Economy Research Center Conference, Big Sky, MT, December 4-7, 1985

"Lessons from the U S, Experience with Energy Price Regulation," International Association of Energy Economists Delegation to the People's Republic of China, Beijing and Shanghai, PRC, June 1985.

"The Impact of Domestic Regulation on the International Competitiveness of American Industry," Harvard/NEC Conference on International Competition, Ft Lauderdale, FL, March 7-9, 1985

"The Welfare and Competitive Effects of Natural Gas Pricing," American Economic Association Annual Meetings, December 1984

"The Ideological Behavior of Legislators," Stanford University Conference on the Political Economy of Public Policy, March 1984

"Principal-Agent Slack in the Theory of Bureaucratic Behavior," Columbia University Center for Law and Economic Studies, 1984

"The Political Power of the Underground Coal Industry," FTC Conference on the Strategic Use of Regulation, March 1984

"Decontrolling Natural Gas Prices The Intertemporal Implications of Theory," International Association of Energy Economists Annual Meetings, Houston, TX, November 1981

"The Role of Government and the Marketplace in the Production and Distribution of Energy," Brown University Symposium on Energy and Economics, March 1981

"A Political Pressure Theory of Oil Pricing," Conference on New Strategies for Managing U S Oil Shortages, Yale University, November 1980

"The Politics of Energy," Eastern Economic Association Annual Meetings, 1977

WORKSHOPS PRESENTED

Federal Reserve Bank of Boston, University of Indiana, University of Montana; Oglala Lakota College, University of New Mexico, Columbia University Law School; Department of Economics and John F Kennedy School of Government, Harvard University, MIT, University of Chicago, Duke University, University of Rochester, Yale University, Virginia Polytechnic Institute, U S Federal Trade Commission, University of Texas, University of Arizona, Federal Reserve Bank of Dallas; U S Department of Justice, Rice University, Washington University, University of Michigan, University of Saskatchewan; Montana State University, UCLA, University of Maryland, National Bureau of Economic Research, University of Southern California

TEACHING

Markets and Market Failure with Cases (Graduate, Kennedy School of Government); Native Americans in the 21st Century Nation Building I & II (Harvard, University-wide, graduate and undergraduate), The Law, Policy, and Economics of Contemporary Tribal Economic Development (Graduate, University of Arizona, School of Law and College of Management), Introduction to Environment and Natural Resource Policy (Graduate, Kennedy School of Government), Seminar in Positive Political Economy (Graduate, Kennedy School of Government), Intermediate Microeconomics for Public Policy (Graduate, Kennedy School of Government), Natural Resources and Public Lands Policy (Graduate, Kennedy School of Government), Economics of Regulation and Antitrust (Graduate), Economics of Regulation (Undergraduate), Introduction to Energy and Environmental Policy (Graduate, Kennedy School of Government), Graduate Seminar in Industrial Organization and Regulation (Graduate), Intermediate Microeconomics (Undergraduate), Principles of Economics (Undergraduate), Seminar in Energy and Environmental Policy (Graduate, Kennedy School of Government)

HONORS AND AWARDS

First American Public Policy Award, First American Leadership Awards 2005, "Realizing the Vision Healthy Communities, Businesses, and Economies," National Center for American Indian Enterprise Development, Phoenix, AZ, June 9, 2005

Allyn Young Prize for Excellence in the Teaching of the Principles of Economics, Harvard University, 1978-1979 and 1979-1980

Chancellor's Intern Fellowship in Economics, September 1973 to July 1978, one of two awarded in 1973, University of California, Los Angeles

Smith-Richardson Dissertation Fellowship in Political Economy, Foundation for Research in Economics and Education, June 1977 to September 1977, UCLA

Summer Research Fellowship, UCLA Foundation, June 1976 to September 1976

Dissertation Fellowship, Hoover Institution, Stanford University, September 1977 to June 1978

Four years of undergraduate academic scholarships, 1969-1973, graduated with University Distinction and Departmental Honors, Stanford University

Research funding sources have included Annie E Casey Foundation; Nathan Cummings Foundation, National Indian Gaming Association, The National Science Foundation, USAID (IRIS Foundation), Pew Charitable Trust, Christian A Johnson Family Endeavor Foundation; The Ford Foundation, The Kellogg Foundation, Harvard Program on the Environment; The Northwest Area Foundation, the U S Department of Energy, the Research Center for Managerial Economics and Public Policy, UCLA Graduate School of Management; the MIT Energy Laboratory, Harvard's Energy and Environmental Policy Center, the Political Economy Research Center; the Center for Economic Policy Research, Stanford University, the Federal Trade Commission, Resources for the Future; and The Rockefeller Foundation

EXPERT TESTIMONY

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Federal Energy Regulatory Commission, Docket No. IN06-3-002, Answer of Energy Transfer Partners, L P, Affidavit (with John R Morris), October 9, 2007; Suppl, Affidavit (with John R Morris), March 31, 2008

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International Court of Arbitration of the International Chamber of Commerce, Korea Deposit Insurance Corporation v Hanwha Companies, ORIX Corporation, and Macquarie Life Limited, ICC No 14501/JB/JEM/EBS (c 14502/JB/JEM/EBS), Expert Report, July 13, 2007, Reply Expert Report, September 7, 2007

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OTHER PROFESSIONAL ACTIVITIES

Board of Directors, Sonoran Institute, 2008-present

National Advisory Board, Big Sky Institute, Montana State University, 2007-present

Board of Trustees, The Communications Institute, 2003-present

Board of Trustees, Fort Apache Heritage Foundation, 2000-present

Mediator (with Keith G Allred), Nez Perce Tribe and the North Central Idaho Jurisdictional Alliance, MOU signed December 2002

Mediator, *In the Matter of the White Mountain Apache Tribe v United States Fish and Wildlife Service*, re· endangered species management authority, May-December, 1994

Steering Committee, National Park Service, 75th Anniversary Symposium, 1991-1993

Board of Trustees, Foundation for American Communications, 1989-2003

Editorial Board, *Economic Inquiry*, 1988-2002

Advisory Committee, Oak Ridge National Laboratory, Energy Division, 1987-1989

Commissioner, President's Aviation Safety Commission, 1987-1988

Principal Lecturer in the Program of Economics for Journalists, Foundation for American Communications, teaching economic principles to working journalists in the broadcast and print media, 1979-present

Lecturer in the Economics Institute for Federal Administrative Law Judges, University of Miami School of Law, 1983-1991

Research Fellow, Energy and Environmental Policy Center, John F Kennedy School of Government, Harvard University, 1981-1987

Editorial Board, MIT Press Series on *Regulation of Economic Activity*, 1984-1992

Research Advisory Committee, American Enterprise Institute, 1979-1985

Editor, *Quarterly Journal of Economics*, 1979-1984

Referee for *American Economic Review, Bell Journal of Economics, Economic Inquiry, Journal of Political Economy, Review of Economics and Statistics, Science Magazine, Journal of Policy Analysis and Management, Social Choice and Welfare, Quarterly Journal of Economics*, MIT Press, North-Holland Press, Harvard University Press, *American Indian Culture and Research Journal*

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Mr. Klick has provided expert testimony in cases involving economic damages; the public and private benefits of proposed mergers and acquisitions, the marginal, incremental and stand-alone costs of services provided by regulated network industries; and the pricing of access to network facilities Much of this testimony has required Mr Klick to analyze complex economic models and to effectively communicate his conclusions to decision-makers.

Mr. Klick has provided testimony before federal and state courts, arbitration panels, the Surface Transportation Board and its predecessor, the Interstate Commerce Commission, the Federal Energy Regulatory Commission, numerous state regulatory agencies, and mediators. He has assisted financial institutions in assessing potential investments in a variety of industries, and has served as a party appointed arbitrator in two complex contract performance disputes between Fortune 50 companies

Mr Klick has in-depth experience in a number of industrial sectors including telecommunications, energy, and transportation and has lectured on economic issues to various technical trade groups In addition, he has taught a well-received Consulting Practicum as part of Georgetown University's MBA program.

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Federal Communications Commission

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Public Utilities Commission of the State of California

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Public Utilities Commission of the State of Colorado

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November 17, 1997	Docket No 97M-063T. In the Matter of the Administration of the Colorado High Cost Fund and the Development of a Cost Model, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996

Public Service Commission of the District of Columbia

March 24, 1997	Formal Case No. 962. In the Matter of the Implementation of the District of *Columbia Telecommunications Competition Act of 1996 and implementation* of 47 U.S C. Section 252 of the Telecommunications Act of 1996
May 2, 1997	Formal Case No 962. In the Matter of the Implementation of the District of Columbia Telecommunications Competition Act of 1996 and implementation of 47 U.S.C. Section 252 of the Telecommunications Act of 1996

Florida Public Service Commission

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Idaho Public Utilities Commission

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State of Iowa Department of Commerce Utilities Board

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Kentucky Public Service Commission

November 4, 1997	Administrative Case No 360 In the Matter of Inquiry Into Universal Service and Funding Issues, Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996.

Louisiana Public Service Commission

August 25, 1997	Docket No. U-22022 Review of cost studies submitted per Local Competition Regulations in order to determine the cost of interconnection and UNEs to establish reasonable, non-discriminatory, cost-based tariffed rates U-22093. Review of tariff filing per Local Competition Regulations, which *tariff introduces interconnection and unbundled services and* establishes the rates, terms, and conditions for such service offerings, Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996.

January 20, 1998	Docket No U-20993, Subdocket A (above Dockets Consolidated), Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996

State of Maryland Public Service Commission

December 5, 1997	Case No. 8766 In the Matter of the Collocation Tariff Filed Under Transmittal No. 1003 by Bell Atlantic-Maryland, Inc., Pursuant to 47 U.S C. Section 252 of the Telecommunications Act of 1996

Minnesota Public Utilities Commission

September 30, 1996	Docket No P-4Y2, YOT/M-96-936 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Midwest, Inc , and GTE Communications, Inc., Pursuant to 47 U.S.C Section 252 of the Telecommunications Act of 1996.
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August 18, 1997	Docket Nos P-42, 5321, 3167, 466, 421/CI-96-1540, OAH Docket No 12-2500-10956-2. In the Matter of Generic Investigation of U S WEST Communications, Inc 's Costs of Providing Interconnection and Unbundled Network Elements, Pursuant to 47 U S.C. Section 252 of the Telecommunications Act of 1996.
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November 14, 1997	Docket No P-442, 407, 5321, 466/CI-96-1541. In the Matter of the Investigation of GTE-Minnesota's Cost of Providing Interconnection and Unbundled Network Elements, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.
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March 2, 1998	Docket Nos. P-42, 5321, 3167, 466, 421/CI-96-1540, OAH Docket No 12-2500-10956-2 In the Matter of Generic Investigation of U S WEST Communications, Inc 's Costs of Providing Interconnection and Unbundled

	Network Elements, Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996.
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Public Service Commission of Missouri

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January 22, 1997	Docket No. D96 11 200 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc., and U S WEST Communications, Inc , Pursuant to 47 U S.C Section 252 of the Telecommunications Act of 1996
January 29, 1997	Docket No D96 11.200. In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc , and U S WEST Communications, Inc., Pursuant to 47 U.S.C Section 252 of *the Telecommunications Act of 1996.*

Nebraska Public Service Commission

October 18, 1996	Docket No. C-1400 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Midwest, Inc , and GTE Communications, Inc., Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996.

New Jersey Board of Public Utilities

September 18, 1996	Docket No. TO 96070519. In the Matter of Petition of AT&T Communications of New Jersey, Inc for Arbitration with Bell Atlantic - New Jersey, Inc., Pursuant to 47 U.S.C Section 252 of the Telecommunications Act of 1996.
December 20, 1996	Docket No. TX 95120631. Notice of Investigation Local Exchange Competition for Telecommunications Services, Pursuant to 47 U S.C. Section 252 of the Telecommunications Act of 1996.
October 20, 1997	Docket No TX 95120631 Notice of Investigation Local Exchange Competition for Telecommunications Services, Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996.

New Mexico Corporation Commission

November 22, 1996	Docket No. 96-411-TC In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc , and U S WEST Communications, Inc , Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996
January 20, 1997	Docket No 96-411-TC In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc , and U S WEST Communications, Inc , Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996
June 13, 1997	Docket No 97-35-TC In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc and GTE Southwest, Inc , Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996
October 21, 1997	Docket No. 96-310-TC, Docket No 97-334-TC. In the Matter of the Implementation of the New Rules Related to the Rural High Cost Fund, and *Low Income Components of the New Mexico Universal Service Fund,* Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.
November 21, 1997	Docket No 96-310-TC, Docket No 97-334-TC In the Matter of the Implementation of the New Rules Related to the Rural High Cost Fund, and Low Income Components of the New Mexico Universal Service Fund, Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996
January 14, 1998	Docket No. 96-310-TC, Docket No 97-334-TC. In the Matter of the Implementation of the New Rules Related to the Rural High Cost Fund, and Low Income Components of the New Mexico Universal Service Fund, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996

State of New York Public Service Commission

March 27, 1998	Case No 95-C-0657. In the matter of Wholesale Provisioning of Local Exchange Service 94-C-0095. In the matter of the Continuing Provision of Universal Service and Developing a Regulatory Framework for the Transition to Competition in the Local Exchange Market 91-C-1174 In the matter of Comparably Efficient Interconnection Arrangements for Residential and Business Links, Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996.
October 31, 2003	Case 03-C-0980 Proceeding On Motion Of The Commission As To The Rates, Charges, Rules And Regulations Relating To The Provisioning Of Direct Current Power By Verizon-New York Inc For Use In Connection With Collocation Spaces
November 24, 2003	Case 03-C-0980 Proceeding On Motion Of The Commission As To The Rates, Charges, Rules And Regulations Relating To The Provisioning Of Direct Current Power By Verizon-New York Inc For Use In Connection With Collocation Spaces

North Carolina Public Staff Utilities Commission

December 15, 1997	Docket No. P-100, Sub 133d. In the Matter of the Determination of Permanent Pricing for Unbundled Network Elements, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.
January 30, 1998	Docket No. P-100, Sub 133b. In the Matter of Establishment of Universal Support Mechanisms, Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996.
February 16, 1998	Docket No P-100, Sub 133d In the Matter of the Determination of Permanent Pricing for Unbundled Network Elements, Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996
March 9, 1998	Docket No.. P-55, Sub 133d In the Matter of the Determination of Permanent Pricing for Unbundled Network Elements, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.
February 16, 2004	Docket No P-100, Sub 133q In the Matter of the Triennial Review Order – UNE-P

State of North Dakota Public Service Commission

November 22, 1996	Docket No PU-453-96-497 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Midwest, Inc., and U S WEST Communications, Inc , Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996
February 14, 1997	Docket No. PU-453-96-497 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Midwest, Inc., and U S WEST Communications, Inc , Pursuant to 47 U S.C. Section 252 of the Telecommunications Act of 1996

November 10, 1997	Docket No. PU-314-97-465. In the Matter of U S WEST Communications, Inc Universal Service Costs Investigation, Pursuant to 47 U S.C. Section 252 of the Telecommunications Act of 1996.
December 22, 1997	Case No. PU-314-97-12 In the Matter of U S West Communications, Inc. Interconnection/ Wholesale Price Investigation, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.

Oregon Public Utility Commission

October 8, 1996	Docket No. ARB-5 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Pacific Northwest, Inc , and GTE Communications, Inc., Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996.
February 24, 1998	UM 731, Phase 111. In the Matter of the Investigation into Universal Service in the State of Oregon, Pursuant to 47 U.S C Section 252 of the Telecommunications Act of 1996

Pennsylvania Public Utility Commission

May 21, 1999	Docket Nos P-00991648 and P-00991649. Petition of Senators and CLECs for Adoption of Partial Settlement and Joint Petition for Global Resolution of Telecommunications Proceeding.

South Carolina Public Service Commission

November 10, 1997	Docket No 97-239-C In the Matter of Intrastate Universal Service Fund, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.

Public Utilities Commission of the State of South Dakota

November 20, 1996	Docket No TC-96-184. In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Midwest, Inc , and U S WEST Communications, Inc., Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996
January 27, 1997	Docket No TC-96-184. In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Midwest, Inc., and U S WEST Communications, Inc , Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996.

Tennessee Regulatory Authority

February 27, 2004	Docket No 03-00491 In re· Implementation of requirements arising from Federal Communications Commission triennial UNE review Local Circuit Switching for Mass Market Customers.

Public Utility Commission of Texas

February 27, 1998	Docket No 18515 Compliance Proceeding for Implementation of the Texas High Cost Universal Service Plan, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996

Public Service Commission of Utah

April 23, 1997	Docket No. 94-999-01 In the Matter of an Investigation Into Collocation and Expanded Interconnection, Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996

Washington Utilities and Transportation Commission

October 28, 1996	Docket No UT-960307 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Pacific Northwest, Inc , and GTE Communications, Inc., Pursuant to 47 U.S.C Section 252 of the Telecommunications Act of 1996.
February 21, 1997	Docket No UT-960369 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale. Docket No UT-960370. In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for U S WEST Communications, Inc Docket No UT-960371 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for GTE Northwest Inc , Pursuant to 47 U S.C. Section 252 of the Telecommunications Act of 1996.
March 28, 1997	Docket No. UT-960369 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale Docket No. UT-960370 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for U S WEST Communications, Inc Docket No. UT-960371. In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for GTE Northwest Inc , Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996
April 25, 1997	Docket No UT-960369 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale Docket No. UT-960370. In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for U S WEST, Communications, Inc Docket No UT-960371. In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for GTE Northwest Incorporated, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.
June 13, 1997	Docket No UT-960369. In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale. Docket No UT-960370 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for U S WEST Communications, Inc. Docket No. UT-960371 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for GTE Northwest Incorporated , Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996

June 20, 1997	Docket No. UT-960369. In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale Docket No. UT-960370 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for U S WEST Communications, Inc Docket No UT-960371 In the Matter of the Pricing Proceeding for Interconnection, Unbundled Elements, Transport and Termination, and Resale for GTE Northwest Incorporated , Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996.
July 21, 2000	Docket No. UT-003013. In the Matter of the Continued Costing and Pricing of Unbundled Network Elements and Transport and Termination, Part A
August 4, 2000	Docket No UT-003013. In the Matter of the Continued Costing and Pricing of Unbundled Network Elements and Transport and Termination, Part A
October 23, 2000	Docket No UT-003013. In the Matter of the Continued Costing and Pricing of Unbundled Network Elements and Transport and Termination, Part B
October 31, 2000	Docket No UT-003013 *In the Matter of the Continued Costing and Pricing* of Unbundled Network Elements and Transport and Termination, Part B
March 26, 2001	Docket No. UT-003013 In the Matter of the Continued Costing and Pricing of Unbundled Network Elements and Transport and Termination, Part B

Public Service Commission of the State of Wyoming

November 22, 1996	Docket No 72000-TF-96-95/70000-TF-96-497 In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc., and US WEST Communications, Inc , Pursuant to *47 U S C Section 252 of the Telecommunications Act of 1996.*
February 6, 1997	Docket No. 72000-TF-96-95/70000-TF-96-497. In the Matter of the Interconnection Contract Negotiations Between AT&T Communications of the Mountain States, Inc., and U S WEST Communications, Inc., Pursuant to 47 U.S C Section 252 of the Telecommunications Act of 1996
September 19, 1997	Docket No 70000-TF-96-319/72000-TF-96-95 In the Matter of the Arbitration by the Public Service Commission of an Interconnection Agreement Between U S WEST Communications, Inc , and AT&T Communications of the Mountain States, Inc., Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996.
October 13, 1997	Docket No. 70000-TF-96-319/72000-TF-96-95 In the Matter of the Arbitration by the Public Service Commission of an Interconnection Agreement Between U S WEST Communications, Inc , and AT&T Communications of the Mountain States, Inc., Pursuant to 47 U S C. Section 252 of the Telecommunications Act of 1996
November 14, 1997	General Order No. 81 In the Matter of the Investigation by the Commission of the Feasibility of Developing Its Own Costing Model for Use in Determining Federal Universal Service Fund Support Obligations in Wyoming, Pursuant to 47 U S C Section 252 of the Telecommunications Act of 1996

November 21, 1997	General Order No 81. In the Matter of the Investigation by the Commission of the Feasibility of Developing Its Own Costing Model for Use in Determining Federal Universal Service Fund Support Obligations in Wyoming, Pursuant to 47 U.S.C. Section 252 of the Telecommunications Act of 1996

ENERGY TESTIMONY

Federal Energy Regulatory Commission

May 20, 1991	Docket No. IS90-21-000 et al. Williams Pipe Line Company.
May 3, 1993	Docket No RM93-11-000 Revisions to Oil Pipeline Regulations Pursuant to the Energy Policy Act of 1992.
November 22, 1993	Docket No. RM93-11-000 Revisions to Oil Pipeline Regulations Pursuant to the Energy Policy Act of 1992
January 23, 1995	Docket No IS90-21-000 et al Williams Pipe Line Company
October, 1999	Affidavit of John C Klick Concerning Declaratory Order Petition of Colonial Pipeline Company
April 17, 2000	Docket No OR00-2-000. ExxonMobil Pipeline Company

TRANSPORTATION TESTIMONY

Special Court (Federal) Created Under Sections 303(c) and 306 of the Regional Rail Reorganization Act

January, 1980	Misc No. 76-1 In the Matter of the Valuation Proceedings

United States District Court for the District of New Mexico

September, 1989	Deposition Testimony in Texas Utilities Company and Chaco energy Company v. Santa Fe Industries, Inc , et al., No. Civ-82-1419 C.

Interstate Commerce Commission

May, 1981	Finance Docket No 30000. Union Pacific Corporation and Union Pacific Railroad Company -- Control -- Missouri Pacific Corporation and Missouri Pacific Railroad Company
February 22, 1983	Docket No 37886S Potomac Electric Power Co v. The Baltimore and Ohio Railroad Co. et al
February 22, 1983	Docket No 37834S Ethyl Corporation v Illinois Central Gulf Railroad, et al.
May, 1983	Docket No. 38182S Consumers Power Company v Norfolk & Western Railway Company
May 31, 1983	Docket No. 38121S Consumers Power Company v Norfolk & Western Railway, et al.

January, 1984	Docket No 36719. Arkansas Power & Light Company, et al. v Burlington Northern Railroad Company and consolidated proceedings.
November 26, 1984	Docket No 37857S. Consumers Power Company v Norfolk and Western Railway Company, et al.
March 8, 1985	Docket No. 36719 Arkansas Power & Light Company, et al v. Burlington Northern Railroad Company and consolidated proceedings.
June, 1985	Docket No 39668 Arkansas Power & Light et al v Burlington Northern Railroad Company
November, 1985	Docket No 39082. Arkansas Power & Light Company et al v Burlington Northern Railroad Company and Missouri Pacific Railroad Company.
January 9, 1986	Docket No 36719. Arkansas Power & Light Company, et al v. Burlington Northern Railroad Company and consolidated proceedings.
February, 1986	Docket No 39082 Arkansas Power & Light Company, et al. v. Burlington Northern Railroad Company and Missouri Pacific Railroad Company
June,1986	Docket No. 36180 San Antonio, Texas, Acting By and Through Its City Public Service Board v Burlington Northern Railroad Company and Southern Pacific Transportation Company
November, 1986	Docket No 37437. Arizona Electric Power Cooperative, Inc. v The Atchison, Topeka and Santa Fe Railway Company, et al
March, 1987	Docket No 37437 Arizona Electric Power Cooperative, Inc v The Atchison, Topeka and Santa Fe Railway Company, et al
May 15, 1987	Docket No 38301S Coal Trading Corporation et al v The Baltimore and Ohio Railroad Company et al
August, 1987	Docket No 37809, 37809 (Sub-No 1). McCarty Farms, Inc , et al v Burlington Northern, Inc and consolidated proceedings
October, 1987	Docket No 37809, 37809 (Sub-No 1). McCarty Farms, Inc et al v Burlington Northern, Inc. and consolidated proceedings
December, 1987	Docket No. 38301S (Sub-No. 1) Westmoreland Coal Sales Company v The Denver & Rio Grande Western Railroad Company, et al
December, 1987	Docket No 37038. Bituminous Coal -- Hiawatha, Utah to Moapa, Nevada and consolidated proceedings
January 14, 1988	Docket No 38301S. Coal Trading Corporation et al v. The Baltimore and Ohio Railroad Company et al.
May 12, 1988	Docket No 37809, 37809 (Sub-No 1). McCarty Farms, Inc. et al v Burlington Northern, Inc and consolidated proceedings
June 20, 1988	Docket No 37038. Bituminous Coal -- Hiawatha, Utah to Moapa, Nevada and consolidated proceedings

July 5, 1988	Docket No 37809, 37809 (Sub-No 1) McCarty Farms, Inc. et al v Burlington Northern, Inc. and consolidated proceedings
April 26, 1989	Docket No 37809, 37809 (Sub-No. 1) McCarty Farms, Inc et al v. Burlington Northern, Inc. and consolidated proceedings
June 21, 1989	Docket No. 37809, 37809 (Sub-No. 1). McCarty Farms, Inc et al v Burlington Northern, Inc and consolidated proceedings.
June 21, 1990	Docket No 40224. Iowa Power and Light Company v. Burlington Northern Railroad Company
July 30, 1990	Docket No 37038. Bituminous Coal -- Hiawatha, Utah to Moapa, Nevada and consolidated proceedings
October 10, 1990	Docket No 37063, 38025S The Dayton Power and Light Company v Louisville and Nashville Railroad Company.
December 14, 1990	Docket No. 37063, 38025S The Dayton Power and Light Company v Louisville and Nashville Railroad Company.
January 25, 1991	Docket No 37063, 38025S The Dayton Power and Light Company v Louisville and Nashville Railroad Company
June 17, 1991	Docket No. 37809, 37809 (Sub-No. 1). McCarty Farms, Inc et al v *Burlington Northern, Inc and consolidated proceedings.*
July 15, 1991	Docket No. 37038. Bituminous Coal -- Hiawatha, Utah to Moapa, Nevada and consolidated proceedings
January 14, 1992	Ex Parte No 347 (Sub No 2) Rate Guidelines -- Non-Coal Proceedings
March 30, 1992	Finance Docket No. 22218 Atchison, Topeka & Santa Fe Railway Company -- Operating Rights -- Southern Pacific Transportation Company
April 24, 1992	Finance Docket No 31951 Southern California Regional Rail Authority For an Order Requiring Joint Use of Terminal Facilities of The Atchison, Topeka and Santa Fe Railway Company
June 15, 1992	Docket No 40581. *Georgia Power Company, Southern Company Services,* Inc , Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton v Southern Railway Company and Norfolk Southern Corporation.
July 27, 1992	Docket No 40581 Georgia Power Company, Southern Company Services, Inc., Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton v. Southern Railway Company and Norfolk Southern Corporation.
November 20, 1992	Docket No 40581. Georgia Power Company, Southern Company Services, Inc , Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton v. Southern Railway Company and Norfolk Southern Corporation

May 7, 1993	Finance Docket No 21215 (Sub No 5) Seaboard Air Line Railroad Company -- Merger -- Atlantic Coast Line Railroad Company -- Petition to Remove Traffic Protective Conditions
March 17, 1994	Ex Parte No. 347 (Sub No. 2). Rate Guidelines -- Non-Coal Proceedings.
May 9, 1994	Finance Docket No. 32467 National Railroad Passenger Corporation and Consolidated Rail Corporation -- Application Under Section 402(a) of the Rail Passenger Service Act for an Order Fixing Just Compensation
June 10, 1994	Finance Docket No 21215 (Sub-No. 5) Seaboard Air Line Railroad Company -- Merger -- Atlantic Coast Line Railroad Company -- Petition to Remove Traffic Protective Conditions.
June 27, 1994	Docket No 40131 (Sub-No. 1) Ashley Creek Phosphate Company v. Chevron Pipe Line Company, et al , I.C.C. Docket No 40810 Ashley Creek Phosphate Company v. SF Industries, et al
October 11, 1994	Finance Docket No. 32549. Burlington Northern, Inc. And Burlington Northern Railroad Company -- Control and Merger -- Santa Fe Pacific Corporation and the Atchison, Topeka and Santa Fe Railway Company
December 13, 1994	Finance Docket No 32467 National Railroad Passenger Corporation and Consolidated Rail Corporation -- Application Under Section 402(a) of the Rail Passenger Service Act for an Order Fixing Just Compensation
January 30, 1995	Finance Docket No. 32433 (Sub-No 1) Chicago and North Western Transportation Company -- Construction and Operation Exemption -- City of Superior, Wisconsin
March 9, 1995	Finance Docket No. 32467. National Railroad Passenger Corporation and Consolidated Rail Corporation -- Application Under Section 402(a) of the Rail *Passenger Service Act for an Order Fixing Just Compensation*
March 29, 1995	Docket No 37809, 38709 (Sub-No 1) McCarty Farms, Inc , et al , and consolidated proceedings
May 30, 1995	Docket No 41191. West Texas Utilities Company v. Burlington Northern Railroad Company.
June 20, 1995	Docket No 40131 (Sub-No. 1). Ashley Creek Phosphate Company v Chevron Pipeline Company, et al
July 28, 1995	Finance Docket No 32467. National Railroad Passenger Corporation and Consolidated Rail Corporation -- Application Under Section 402(a) of the Rail Passenger Service Act For an Order Fixing Just Compensation.
October 30, 1995	Docket No. 41185 Arizona Public Service Company and Pacificorp v The Atchison, Topeka and Santa Fe Railway Company.

Surface Transportation Board

February 20, 1996	Ex Parte No. 347 (Sub-No 2) Rate Guidelines -- Non-Coal Proceedings.
March 19, 1996	Ex Parte No. 347 (Sub-No 2) Rate Guidelines -- Non-Coal Proceedings

April 1, 1996	Docket No 32630 (Sub 1). Petition of Omaha Power District Under 49 U S C 10901(d)
April 29, 1996	Finance Docket No. 32760. Union Pacific Corporation, Union Pacific Railroad Company and Missouri Pacific Railroad Company -- Control and Merger -- Southern Pacific Rail Corporation, Southern Pacific Transportation Company, St. Louis Southwestern Railway Company, SPCSL Corp., and The Denver & Rio Grande Western Railroad Company
May 23, 1996	Docket No. 41191. West Texas Utilities Company v Burlington Northern Railroad Company -- Petition of Burlington Northern Railroad Company to Reopen Proceeding.
October 15, 1996	Docket No 41242. Central Power & Light Company v. Southern Pacific Transportation Company, Docket No. 41295 Pennsylvania Power & Light Company v Consolidated Rail Corporation; Docket No 41626 MidAmerican Energy Company v Union Pacific Railroad Company and Chicago & North Western Railway Company.
October 25, 1996	Docket No. 41242 Central Power & Light Company v. Southern Pacific Transportation Company; Docket No 41295 Pennsylvania Power & Light Company v Consolidated Rail Corporation, Docket No 41626 MidAmerican Energy Company v Union Pacific Railroad Company and Chicago & North Western Railway Company.
June 16, 1997	Finance docket No 33388 CSX Crop And CSX Transportation, Inc , Norfolk Southern Corporation and Norfolk Southern Railway Company – Control – Conrail, Inc and Consolidated Rail Corporation
July 11, 1997	Docket No. 41989 Potomac Electric Power Company v. CSX Transportation, Inc Reply Statement and Evidence of Defendant CSX Transportation, Inc
November 10, 1997	Docket No. 41685 In the Matter of CF Industries, Inc v. Koch Pipeline Company, L.P., Opening Joint Verified Statement
January 9, 1998	Docket No. 41685. In the Matter of CF Industries, Inc v Koch Pipeline Company, L.P., Reply Verified Statement
March 2, 1998	Docket No 41685. In the Matter of CF Industries, Inc v Koch Pipeline Company, L P , Rebuttal Joint Verified Statement
July, 1998	Finance Docket No 33556 Canadian National Railway Company, Grand Trunk Corporation, and Grand Trunk Western Railroad Incorporated – Control – Illinois Central Corporation, Chicago, Central & Pacific Railroad Company, and Cedar River Railroad Company Railroad Control Application
March 31, 1999	Docket No 42022. FMC Corporation and FMC Wyoming Corporation v Union Pacific Railroad Company, Reply Verified Statement
May 19, 1999	Docket No 33726. Western Coal Traffic League v Union Pacific Railroad Company

August 14, 2000	Docket No 42051 Wisconsin Power and Light Company v Union Pacific Railroad Company, Reply Verified Statement
March 13, 2001	Docket No 42054 PPL Montana, LLC v The Burlington Northern Santa Fe Railway Company, Reply Verified Statement of Christopher D Kent and John C Klick
January 15, 2002	Docket No 42057 Texas Municipal Power Agency v. The Burlington Northern Santa Fe Railway Company, Reply Verified Statement of Christopher D Kent and John C Klick
May 24, 2002	Docket No 42069, Duke Energy Corporation v. Norfolk Southern Railway Company, Part II of Opening Evidence and Argument of Norfolk Southern Railway Company
May 24, 2002	Docket No. 42070, Duke Energy Corporation v. CSX Transportation, Inc , Part IV-B and Part IV-E of Opening Evidence and Argument of CSX Transportation, Inc
June 10, 2002	Docket No. 42072, Carolina Power & Light Company v. Norfolk Southern Railway Company, Part II of Opening Evidence and Argument of Norfolk Southern Railway Company
September 20, 2002	Docket No 42070, Duke Energy Corporation v. CSX Transportation, Inc., Parts III-G, III-H, and III-I of Reply Evidence and Argument of CSX Transportation, Inc
September 30, 2002	Docket No. 42069, Duke Energy Corporation v Norfolk Southern Railway Company, Parts II-A, III-G, III-H, and III-I of Reply Evidence and Argument of Norfolk Southern Railway Company
October 11, 2002	Docket No. 42072, Carolina Power & Light Company v. Norfolk Southern *Railway Company, Parts II-A, III-G, III-H, and III-I of Reply Evidence and* Argument of Norfolk Southern Railway Company
November 12, 2002	Docket No 42070, Duke Energy Corporation v. CSX Transportation, Inc , Part II-B of Rebuttal Evidence and Argument of CSX Transportation, Inc.
November 19, 2002	Docket No 42069, Duke Energy Corporation v. Norfolk Southern Railway Company, Part II of Rebuttal Evidence and Argument of Norfolk Southern Railway Company
November 27, 2002	Docket No 42072, Carolina Power & Light Company v. Norfolk Southern Railway Company, Part II-A and II-B of Rebuttal Evidence and Argument of Norfolk Southern Railway Company
January 10, 2003	Docket No. 42057, Public Service Company of Colorado D/B/A Xcel Energy v The Burlington Northern and Santa Fe Railway Company, Part II-A of Opening Evidence and Argument of The Burlington Northern and Santa Fe Railway Company

April 4, 2003	Docket No. 42057, Public Service Company of Colorado D/B/A Xcel Energy v. The Burlington Northern and Santa Fe Railway Company, Part III-A of Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
May 27, 2003	STB Docket No 42058. Arizona Electric Power Cooperative, Inc v The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
July 7, 2003	STB Docket No. 42054 PPL Montana, LLC v The Burlington Northern and Santa Fe Railway, Defendant's (BNSF's) Reply Evidence and Argument on Reopening
October 8, 2003	STB Docket No 42071. Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence of the Burlington Northern and Santa Fe Railway Company
March 22, 2004	STB Docket No 42071 Otter Tail Power Company v The Burlington Northern and Santa Fe Railway Company, Supplemental Reply Evidence of The Burlington Northern and Santa Fe Railway Company
May 24, 2004	STB Docket No 41191 (Sub-No. 1) AEP Texas North Company v The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
March 1, 2005	Docket No 42071 Otter Tail Power Company v BNSF Railway Company, Supplemental Evidence of BNSF Railway Company
July 20, 2005	Docket No. 42088 Western Fuels Association, Inc and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Reply Evidence of BNSF Railway Company
October 20, 2005	Docket No 42088 Western Fuels Association, Inc and Basin Electric Power Cooperative, Inc v BNSF Railway Company, Surrebuttal Evidence of BNSF Railway Company
May 1, 2006	Docket No Ex Parte 657 (Sub-No 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Comments of BNSF Railway Company
May 31, 2006	Docket No Ex Parte 657 (Sub-No 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Reply Comments of BNSF Railway Company
June 30, 2006	Docket No. Ex Parte 657 (Sub-No. 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Rebuttal Comments of BNSF Railway Company
October 24, 2005	Docket No Ex Parte 646 (Sub-No 1) Simplified Standards for Rate Cases, Verified Statement Supporting Opening Comments of BNSF Railway Company
November 30, 2005	Docket No Ex Parte 646 (Sub-No 1) Simplified Standards for Rate Cases, Verified Statement Supporting Reply Comments of BNSF Railway Company

District Court of Nebraska

September 17, 1992	Civil Action 4.CV91-3095 Burlington Northern Railway Company v. Omaha Public Power District In the District Court for the District of Nebraska
March 29, 1996	Civil Action 4 94cv3182 Burlington Northern Railway Company v. Nebraska Public Power District In the District Court for the District of Nebraska
April 29, 1996	Civil Action 4 94cv3182 Burlington Northern Railway Company v Nebraska Public Power District In the District Court for the District of Nebraska
July 30, 1999	Civil Action 8 97CV00345, Entergy Services, Inc and Entergy Arkansas, Inc. v Union Pacific Railroad Company.

102nd Judicial District Court, Bowie County, Texas

1994	Trial Court No D102CV910720 Burlington Northern Railroad Company v Southwestern Electric Power Company In the 102nd Judicial District Court, Bowie County, Texas

Arbitrations and Mediations

February 16, 1988	Arbitration Proceedings, Phase III. Damages - Escanaba & Lake Superior Railroad Company v. Soo Line Railroad Company
June 23, 1988	Arbitration Proceedings, Phase III -- Damages - Escanaba & Lake Superior Railroad Company v. Soo Line Railroad Company
August 15, 1988	Arbitration Proceedings, Phase III -- Damages - Escanaba & Lake Superior Railroad Company v. Soo Line Railroad Company
January 24, 1992	In the Matter of the Arbitration Between Tuco Inc , Burlington Northern Railroad Company and The Atchison, Topeka and Santa Fe Railroad Company
February 21, 1992	In the Matter of the Arbitration Between Tuco, Inc and Burlington Northern Railroad Company and Atchison, Topeka & Santa Fe Railroad Company.
March 24, 1992	In the Matter of the Arbitration Between Tuco, Inc., Burlington Northern Railroad Company and Atchison, Topeka & Santa Fe Railroad Company
July 20, 1992	In the Matter of the Arbitration Between Wisconsin Power & Light Company and Burlington Northern Railroad Company, et. al
September 4, 1992	In the Matter of the Arbitration Between Wisconsin Power & Light Company and Burlington Northern Railroad Company, et. al.
October 4, 1993	In the Matter of the Arbitration Between Public Service Company of Oklahoma and Burlington Northern Railroad Company
February 21, 1994	In the Matter of the Arbitration Between Public Service Company of Oklahoma and Burlington Northern Railroad Company
May 3, 1999	Elisra Electronics Systems, Ltd V. Qualcomm, Inc., Before the American Arbitration Association No 50 T 181 00005 98

September 23, 1999	Statistical Analysis of Cap Gemini Report for Lee & Allen, Inc., submitted in UGI/Transco Mediation (London, England)
September, 1999 To Present	Party-appointed Arbitrator in MCI Worldcom, Inc. and AT&T Corp , v Bell Atlantic Corporation, an arbitration conducted under the rules of the CPR Institute for Dispute Resolution.
October, 2000 To Present	Party-appointed Arbitrator in Competitive Local Exchange Carriers v. SBC Communications, Inc., an arbitration conducted under the rules of the CPR Institute for Dispute Resolution
March 7, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J.B. Hunt Transport, Inc , Expert Report on behalf of BNSR Railway Company
March 28, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B Hunt Transport, Inc., Rebuttal Expert Report on behalf of BNSR Railway Company
April 12, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B Hunt Transport, Inc , Supplemental Expert Report on behalf of BNSR Railway Company

3

Exhibit 3: Revenue Requests – New Asset Purchase

Year 1 Revenue Requirement	$9,568,945
Initial Investment	$100,000,000
Cost of Capital	10%
Inflation Rate	3%

	New Asset Purchased in Year 0						New Asset Purchased in Year 5					
Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0			$100,000,000									
1	$9,568,945	($9,568,945)	$100,431,055	($10,000,000)	$431,055	10.0%						
2	$9,856,014	($9,856,014)	$100,618,146	($10,043,106)	$187,092	10.0%						
3	$10,151,694	($10,151,694)	$100,528,267	($10,061,815)	($89,879)	10.0%						
4	$10,456,245	($10,456,245)	$100,124,849	($10,052,827)	($403,419)	10.0%						
5	$10,769,932	($10,769,932)	$99,367,401	($10,012,485)	($757,447)	10.0%			$115,927,407			
6	$11,093,030	($11,093,030)	$98,211,111	($9,936,740)	($1,156,290)	10.0%	$11,093,030	($11,093,030)	$116,427,112	($11,592,741)	$499,712	10.0%
7	$11,425,821	($11,425,821)	$96,906,401	($9,821,111)	($1,304,710)	10.0%	$11,425,821	($11,425,821)	$116,644,009	($11,642,712)	$216,891	10.0%
8	$11,768,596	($11,768,596)	$94,498,445	($9,690,640)	($2,107,956)	10.0%	$11,768,596	($11,768,596)	$116,539,814	($11,664,401)	($104,195)	10.0%
9	$12,121,654	($12,121,654)	$91,926,536	($9,449,845)	($2,571,909)	10.0%	$12,121,654	($12,121,654)	$116,072,141	($11,653,981)	($467,673)	10.0%
10	$12,485,303	($12,485,303)	$88,623,397	($9,192,654)	($3,302,940)	10.0%	$12,485,303	($12,485,303)	$115,194,052	($11,607,214)	($878,089)	10.0%
11	$12,859,862	($12,859,862)	$84,516,534	($8,862,400)	($4,007,463)	10.0%	$12,859,862	($12,859,862)	$113,853,596	($11,519,405)	($1,340,457)	10.0%
12	$13,245,656	($13,245,656)	$79,722,529	($8,451,653)	($4,794,005)	10.0%	$13,245,658	($13,245,658)	$111,993,296	($11,385,359)	($1,860,299)	10.0%
13	$13,643,026	($13,643,026)	$74,051,754	($7,972,253)	($5,670,775)	10.0%	$13,643,025	($13,643,025)	$109,549,598	($11,199,330)	($2,443,698)	10.0%
14	$14,052,319	($14,052,319)	$67,404,910	($7,405,175)	($6,647,143)	10.0%	$14,052,319	($14,052,319)	$106,452,239	($10,954,960)	($3,097,359)	10.0%
15	$14,473,888	($14,473,888)	$59,671,153	($6,740,461)	($7,733,427)	10.0%	$14,473,888	($14,473,888)	$102,623,574	($10,645,224)	($3,828,665)	10.0%
16	$14,908,105	($14,908,105)	$50,730,196	($5,967,113)	($8,940,967)	10.0%	$14,908,105	($14,908,105)	$97,977,827	($10,262,357)	($4,645,748)	10.0%
17	$15,355,348	($15,355,348)	$40,447,868	($5,073,020)	($10,282,329)	10.0%	$15,355,348	($15,355,348)	$92,420,261	($9,797,783)	($5,557,566)	10.0%
18	$15,816,009	($15,816,009)	$28,676,646	($4,044,787)	($11,771,222)	10.0%	$15,816,009	($15,816,009)	$85,846,278	($9,242,026)	($6,573,983)	10.0%
19	$16,290,489	($16,290,489)	$15,253,821	($2,867,665)	($13,422,824)	10.0%	$16,290,489	($16,290,489)	$78,140,417	($8,584,628)	($7,705,861)	10.0%
20	$16,779,204	($16,779,204)	$0	($1,525,382)	($15,253,821)	10.0%	$16,779,204	($16,779,204)	$69,175,255	($7,814,042)	($8,965,162)	10.0%
21							$17,282,580	($17,282,580)	$58,810,201	($6,917,526)	($10,365,054)	10.0%
22							$17,801,057	($17,801,057)	$46,890,164	($5,881,020)	($11,920,037)	10.0%
23							$18,335,089	($18,335,089)	$33,244,092	($4,689,016)	($13,646,072)	10.0%
24							$18,885,141	($18,885,141)	$17,663,360	($3,324,409)	($15,580,732)	10.0%
25							$19,451,696	($19,451,696)	$0	($1,766,336)	($17,663,360)	10.0%

Exhibit 3: Revenue Requests – New Asset Purchase

Year 1 Revenue Requirement	$9,568,945
Initial Investment	$100,000,000
Cost of Capital	10%
Inflation Rate	3%

New Asset Purchased in Year 0

Year	Revenues					
0						
1	$9,568,945					
2	$9,856,014					
3	$10,151,694					
4	$10,456,245					
5	$10,769,932					
6	$11,093,030					
7	$11,425,821					
8	$11,768,596					
9	$12,121,654					
10	$12,485,303	($12,485,303)		…2,664)	($3,302,640)	
11	$12,859,862	($12,859,862)		…2 852 400)	($4,007,483)	
12	$13,245,656	($13,245,656		($8,451,653)	($4,794,005)	10.…
13	$13,643,028	($13,643,02…	…754	($7,972,253)	($5,670,776)	10.0%
14	$14,052,319	($14,052,3…	…404,610	($7,405,175)	($6,647,143)	10.0%
15	$14,473,888	($14,473,8…	$59,571,183	($6,740,461)	($7,733,427)	10.0%
16	$14,908,105	($14,908,…	$50,730,196	($5,967,113)	($8,940,987)	10.0%
				…000)	($10,282,309)	10.0%
				…787)	($11,771,222)	10.0%
				…665)	($13,422,824)	10.0%
				…360)	($15,253,821)	10.0%
24						
25						

For any given year, the revenue requirement is identical, regardless of the age of the asset.

$12,859,862

New Asset Purchased in Year 5

	Payment	Principal	Return on Capital	Depreciation	ROI
		$115,927,407			
	…11,093,030)	$116,427,112	($11,592,741)	$499,710	10.0%
	…11,425,821)	$116,644,009	($11,642,712)	$216,891	10.0%
	…11,768,596)	$116,539,814	($11,664,401)	($104,195)	10.0%
	…12,121,654)	$116,072,141	($11,653,981)	($467,672)	10.0%
$12,485,303	($12,485,303)	$115,194,052	($11,607,214)	($878,089)	10.0%
$12,859,862	($12,859,862)	$113,853,595	($11,519,405)	($1,340,457)	10.0%
$13,245,656	($13,245,656)	$111,993,296	($11,385,359)	($1,860,299)	10.0%
$13,643,028	($13,643,028)	$109,549,598	($11,199,330)	($2,443,698)	10.0%
$14,052,319	($14,052,319)	$106,452,239	($10,954,960)	($3,097,359)	10.0%
$14,473,888	($14,473,888)	$102,623,574	($10,645,224)	($3,828,665)	10.0%
$14,908,105	($14,908,105)	$97,977,827	($10,262,357)	($4,645,748)	10.0%
				($5,557,568)	10.0%
				($6,573,983)	10.0%
				($7,706,981)	10.0%
				($8,965,162)	10.0%
				($10,365,054)	10.0%
				($11,920,037)	10.0%
				($13,646,072)	10.0%
$18,385,141	($18,385,141)	$17,683,360	($3,324,409)	($15,560,732)	10.0%
$19,451,696	($19,451,696)	$0	($1,768,336)	($17,683,360)	10.0%

$12,859,862

Exhibit 3A: Revenue Requests – New Asset Purchase With Renewal in Year 20

Starting Annual Revenues (Year 0)	$9,290,238
Initial Investment	$100,000 000
Cost of Capital	10%
Inflation Rate	3%

	New Asset Purchased in Year 0						New Asset Purchased in Year 5					
Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0			$100,000,000									
1	$9,568,945	($9,568,945)	$100,431,055	($10,000,000)	$431,055	10.0%						
2	$9,856 014	($9,856 014)	$100,618,146	($10,043,105)	$187 092	10.0%						
3	$10,151,694	($10,151,694)	$100,528 267	($10,061,815)	($89,879)	10.0%						
4	$10,456,245	($10,456,245)	$100,124 849	($10,052,827)	($403,418)	10.0%						
5	$10,769,932	($10,769,932)	$99,367,401	($10,012,485)	($757,447)	10.0%			$115,927,407			
6	$11,093,030	($11,093,030)	$98,211,111	($9,936,740)	($1,156,290)	10.0%	$11,093,030	($11,093,030)	$116,427,118	($11,592,741)	$499,710	10.0%
7	$11,425,821	($11,425,821)	$96 606,401	($9,821,111)	($1,604,710)	10.0%	$11 425,821	($11,425,821)	$116,644,009	($11,642,712)	$216,891	10.0%
8	$11,768,596	($11,768,596)	$94,498,445	($9,660 640)	($2,107,956)	10.0%	$11,768,596	($11,768,596)	$116,539,814	($11,664,401)	($104,195)	10.0%
9	$12,121,654	($12,121,654)	$91,826,636	($9,449,845)	($2,671,809)	10.0%	$12 121,654	($12,121,654)	$116,072,141	($11,653,981)	($467,672)	10.0%
10	$12,485,303	($12,485,303)	$88,523,997	($9,182,664)	($3,302,640)	10.0%	$12,485,303	($12,485,303)	$115,194,052	($11,607,214)	($878,089)	10.0%
11	$12,859 862	($12,859,862)	$84,516,534	($8,852,400)	($4,007,463)	10.0%	$12,859,862	($12,859,862)	$113,853,595	($11,519,405)	($1,340,457)	10.0%
12	$13,245,658	($13,245,658)	$79,722,529	($8,451,653)	($4,794,005)	10.0%	$13,245,658	($13,245,658)	$111 993 296	($11,385,359)	($1,860,299)	10.0%
13	$13,643,028	($13,643,028)	$74,051,754	($7,972,253)	($5 670,775)	10.0%	$13,643,028	($13,643,028)	$109,549 598	($11,199,330)	($2,443,698)	10.0%
14	$14,052,319	($14,052,319)	$67,404,610	($7,405,175)	($6,647,143)	10.0%	$14,052,319	($14,052,319)	$106,452 239	($10,954,960)	($3,097,359)	10.0%
15	$14 473,888	($14,473,888)	$59,671,183	($6,740 461)	($7,733,427)	10.0%	$14 473,888	($14 473,888)	$102,623,574	($10,645,224)	($3,828,665)	10.0%
16	$14,908,105	($14,908,105)	$50,730,196	($5,967,118)	($8 940,987)	10.0%	$14,908,105	($14,908,105)	$97,977,827	($10,262,357)	($4,645,748)	10.0%
17	$15,355,348	($15,355,348)	$40,447,868	($5,073,020)	($10,282,329)	10.0%	$15,355,348	($15,355,348)	$92,420,261	($9,797 783)	($5,557,566)	10.0%
18	$15,816,009	($15,816,009)	$28,676,646	($4,044,787)	($11 771,222)	10.0%	$15,816,009	($15,816,009)	$85 846 278	($9,242,026)	($6,573,983)	10.0%
19	$16,290,489	($16,290,489)	$15,253,821	($2,867,665)	($13,422,824)	10.0%	$16,290 489	($16,290,489)	$78 140,417	($8,584 628)	($7,705 861)	10.0%
20	$16,779,204	($16,779 204)	$0	($1,525,382)	($15 253,821)	10.0%	$16,779,204	($16,779,204)	$69,175 255	($7,814,042)	($8,965 162)	10.0%
20			$180,611,123									
21	$17,282,580	($17,282,580)	$181,389,656	($18,061,112)	$778,533	10.0%	$17,282,580	($17,282,580)	$58,810,201	($6,917,526)	($10,365,054)	10.0%
22	$17,801,057	($17,801,057)	$181,727 565	($18,138,966)	$337,909	10.0%	$17 801,057	($17,801,057)	$46,890,164	($5,881,020)	($11,920,037)	10.0%
23	$18,335,089	($18,335 089)	$181,565,232	($18,172,756)	($162 332)	10.0%	$18,335,089	($18,335,089)	$33,244,092	($4,689,016)	($13,646,072)	10.0%
24	$18,885,141	($18,885,141)	$180,836,614	($18,156,523)	($728,618)	10.0%	$18,885,141	($18 885,141)	$17 683,360	($3,324,409)	($15,560,732)	10.0%
25	$19,451,696	($19,451,696)	$179,468,580	($18,083,661)	($1,368,034)	10.0%	$19,451,696	($19,451,696)	$0	($1,768,336)	($17,683,360)	10.0%
	$20,035,247	($20,035,247)	$177,380,191	($17,946,858)	($2 088,389)	10.0%						
	$20,636,304	($20,636,304)	$174,481,906	($17,738,019)	($2,898,285)	10.0%						
	$21,255 393	($21,255,393)	$170,674,704	($17,448,191)	($3,807 202)	10.0%						
	$21,893,055	($21,893,055)	$165,849 119	($17,067,470)	($4,825,585)	10.0%						
	$22,549,847	($22,549,847)	$159,884,185	($16,584,912)	($5,964 935)	10.0%						
	$23,226,342	($23,226,342)	$152,646,261	($15,988,418)	($7,237,923)	10.0%						
	$23,923,132	($23,923,132)	$143,987,755	($15,264,626)	($8 658,506)	10.0%						
	$24 640,826	($24,640,826)	$133,745,705	($14,398,776)	($10,242,051)	10.0%						
	$25 380,051	($25,380,051)	$121,740,224	($13,374,570)	($12 005,480)	10.0%						
	$26,141,452	($26,141 452)	$107,772,794	($12,174,022)	($13,967,430)	10.0%						
	$26,925,696	($26 925,696)	$91,624,377	($10,777,279)	($16,148,417)	10.0%						
	$27,733,467	($27,733,467)	$73,053,348	($9,162,436)	($18,571,029)	10.0%						
	$28,565 471	($28,565,471)	$51,793,212	($7,305,335)	($21,260,136)	10.0%						
	$29 422 435	($29 422,435)	$27,550,098	($5,179 321)	($24,243,114)	10.0%						
	$30,305,108	($30,305,108)	$0	($2,755 010)	($27,550,098)	10.0%						

Exhibit 3A: Revenue Requests – New Asset Purchase With Renewal in Year 20

Starting Annual Revenues (Year 0)	$9 290,238
Initial Investment	$100,000,000
Cost of Capital	10%
Inflation Rate	3%

For any given year, the revenue requirement is identical, regardless of the age of the asset.

$18,335,089

$18,335,089

	New Asset Purchased in Year 0						New Asset Purchased in Year 5					
Year	Revenues							Payment	Principal	Return on Capital	Depreciation	ROI
0												
1	$9,568,945											
2	$9,856,014											
3	$10,151,694											
4	$10,456,245											
5	$10 769 932								$115,927 407			
6	$11 093,030							11,093,030)	$116,427,118	($11 592,741)	$499 710	10 0%
7	$11,425,821							11 425,821)	$116,644 009	($11,642,712)	$216 891	10 0%
8	$11 768 596							11,768,596)	$116,539,814	($11,664,401)	($104,195)	10 0%
9	$12,121,654							($12,121,654)	$116,072,141	($11,653,981)	($467,672)	10 0%
10	$12,485,303	($12,485,303)		,182,684)	($3,302,640)		$12,485,303	($12,485,303)	$115,194,052	($11,607,214)	($878,089)	10 0%
11	$12,859,862	($12,859 862		($8,852,400)	($4,007,463)		$12,859,862	($12,859,862)	$113,853,595	($11,519,405)	($1,340,457)	10 0%
12	$13,245,658	($13,245,65	829	($8,451,653)	($4,794,005)	10 0	$13,245,658	($13,245,658)	$111 993,296	($11,385,359)	($1,860 299)	10 0%
13	$13,643,028	($13,643,02	51,754	($7 972 253)	($5,670,775)	10 0%	$13,643,028	($13 643,028)	$109 549,598	($11,199,330)	($2,443,698)	10 0%
14	$14,052 319	($14,052,3	67,404,610	($7,405,175)	($6,647,143)	10 0%	$14,052,319	($14,052,319)	$106,452 239	($10,954,960)	($3,097,359)	10 0%
15	$14,473,888	($14,473,8	$59,671,183	($6,740,461)	($7,733,427)	10 0%	$14,473,888	($14,473,888)	$102,623,574	($10,645,224)	($3,828,665)	10 0%
				,118)	($8 940,987)	10 0%					($4,645,748)	10 0%
				,020)	($10,282,329)	10 0%					($5,557,566)	10 0%
				787)	($11 771,222)	10 0%					($6,573,983)	10 0%
				,665)	($13,422,824)	10 0%					($7,705,861)	10 0%
				,382)	($15,253,821)	10 0%					($8,965,162)	10 0%
				,112)	$778,533	10 0%					($10,365,054)	10 0%
22	$17,801,057	($17,801,057)	$181,727,565	($18,138,966)	$337,909	10 0%	$17 801,057	($17,801,057)	$46,890,164	($5,881 020)	($11,920,037)	10 0%
23	$18,335,089	($18,335,089)	$181,565,232	($18,172,756)	($162 332)	10 0%	$18,335,089	($18,335,089)	$33,244,092	($4,689 016)	($13,646,072)	10 0%
24	$18 885,141	($18,885 141)	$180,836,614	($18,156,523)	($728,618)	10 0%	$18,885,141	($18,885,141)	$17 683,360	($3,324,409)	($15,560,732)	10 0%
25	$19,451,696	($19,451,696)	$179,468,580	($18,083,661)	($1,368,034)	10 0%	$19,451 696	($19,451,696)	$0	($1 768,336)	($17,683,360)	10 0%
	$20 035 247	($20 035,247)	$177,380,191	($17,946,858)	($2,088,389)	10 0%						
	$20 636 304	($20,636,304)	$174,481 906	($17,738,019)	($2,898,285)	10 0%						
	$21,255,393	($21,255,393)	$170,674 704	($17,448,191)	($3,807,202)	10 0%						
	$21 893,055	($21,893,055)	$165,849,119	($17,067,470)	($4,825,585)	10 0%						
	$22,549,847	($22,549,847)	$159,884,185	($16,584,912)	($5,964,935)	10 0%						
	$23,226,342	($23,226,342)	$152,646,261	($15,988,418)	($7,237 923)	10 0%						
	$23,923,132	($23,923,132)	$143,987,755	($15,264,626)	($8,658,506)	10 0%						
	$24,640,826	($24,640 826)	$133,745,705	($14,398,776)	($10,242 051)	10 0%						
	$25,380,051	($25,380,051)	$121,740 224	($13,374,570)	($12,005,480)	10 0%						
	$26,141,452	($26,141,452)	$107,772,794	($12,174 022)	($13,967,430)	10 0%						
	$26,925,696	($26,925,696)	$91,624,377	($10,777,279)	($16,148,417)	10 0%						
	$27,733,467	($27,733,467)	$73,053,348	($9,162,438)	($18,571,029)	10 0%						
	$28,565,471	($28,565,471)	$51,793 212	($7,305 335)	($21,260,136)	10 0%						
	$29,422,435	($29,422,435)	$27 550 098	($5,179,321)	($24 243,114)	10 0%						
	$30,305,108	($30,305,108)	$0	($2,755,010)	($27,550,098)	10 0%						

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Exhibit 4: Revenue Requests – New Versus Used Asset Purchase

Year 1 Revenue Requirement	$9,568 945
Initial Investment	$100,000 000
Cost of Capital	10%
Inflation Rate	3%

	New Asset Purchased in Year 0						Used Asset Purchased in Year 5					
Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0			$100,000,000									
1	$9,568 945	($9,568,945)	$100,431,055	($10,000,000)	$431,055	10 0%						
2	$9 856 014	($9,856,014)	$100,618,146	($10,043,105)	$187,092	10 0%						
3	$10 151 694	($10,151,694)	$100,528,267	($10,061,815)	($89,879)	10 0%						
4	$10,456,245	($10,456,245)	$100,124,849	($10,052,827)	($403,418)	10 0%						
5	$10,769 932	($10,769,932)	$99 367,401	($10,012 485)	($757,447)	10 0%			$99,367 401			
6	$11,093 030	($11,093,030)	$98,211,111	($9,936 740)	($1,156,290)	10 0%	$11,093,030	($11,093,030)	$98 211,111	($9,936,740)	($1 156,290)	10 0%
7	$11 425 821	($11,425,821)	$96,606,401	($9,821,111)	($1,604,710)	10 0%	$11,425,821	($11,425,821)	$96 606 401	($9 821,111)	($1,604,710)	10 0%
8	$11,768 596	($11,768,596)	$94,498,445	($9,660,640)	($2,107,956)	10 0%	$11,768,596	($11,768,596)	$94,498,445	($9,660,640)	($2,107,956)	10 0%
9	$12,121,654	($12,121 654)	$91,826,636	($9,449,845)	($2,671,809)	10 0%	$12,121,654	($12,121,654)	$91,826,636	($9,449,845)	($2,671,809)	10 0%
10	$12 485,303	($12,485,303)	$88,523,997	($9,182,664)	($3,302,640)	10 0%	$12,485,303	($12,485,303)	$88,523,997	($9,182,664)	($3,302,640)	10 0%
11	$12 859 862	($12,859,862)	$84,516 534	($8,852,400)	($4,007,463)	10 0%	$12,859,862	($12,859,862)	$84,516,534	($8,852,400)	($4,007,463)	10 0%
12	$13,245 658	($13,245 658)	$79,722 529	($8 451,653)	($4,794 005)	10 0%	$13,245,658	($13,245,658)	$79 722,529	($8,451 653)	($4,794 005)	10 0%
13	$13,643 028	($13,643 028)	$74 051,754	($7,972 253)	($5,670,775)	10 0%	$13,643,028	($13,643,028)	$74,051,754	($7,972,253)	($5,670,775)	10 0%
14	$14,052 319	($14,052,319)	$67,404,610	($7,405 175)	($6,647 143)	10 0%	$14,052,319	($14,052 319)	$67 404 610	($7,405,175)	($6 647,143)	10 0%
15	$14,473 888	($14,473,888)	$59,671,183	($6,740,461)	($7 733,427)	10 0%	$14,473,888	($14,473,888)	$59 671 183	($6,740 461)	($7,733 427)	10 0%
16	$14,908,105	($14,908,105)	$50 730,196	($5,967,118)	($8,940,987)	10 0%	$14,908,105	($14,908,105)	$50 730,196	($5,967 118)	($8,940,987)	10 0%
17	$15,355,348	($15,355,348)	$40,447,868	($5,073,020)	($10,282,329)	10 0%	$15,355,348	($15,355,348)	$40 447 868	($5,073,020)	($10,282,329)	10 0%
18	$15,816,009	($15,816,009)	$28 676 646	($4,044 787)	($11,771,222)	10 0%	$15 816,009	($15,816,009)	$28,676,646	($4,044 787)	($11,771,222)	10 0%
19	$16,290,489	($16,290,489)	$15 253 821	($2,867,665)	($13,422,824)	10 0%	$16,290,489	($16,290,489)	$15,253,821	($2,867,665)	($13,422,824)	10 0%
20	$16,779,204	($16,779,204)	$0	($1,525,382)	($15,253,821)	10 0%	$16,779,204	($16 779,204)	$0	($1,525,382)	($15,253,821)	10 0%

Exhibit 4: Revenue Requests – New Versus Used Asset Purchase

Year 1 Revenue Requirement	$9,568,945
Initial Investment	$100,000,000
Cost of Capital	10%
Inflation Rate	3%

	New Asset Purchased in Year 0						Used Asset Purchased in Year 5					
Year	Revenues							Payment	Principal	Return on Capital	Depreciation	ROI
0												
1	$9,568,945											
2	$9,856,014											
3	$10 151,694											
4	$10,456,245											
5	$10,769,932								$99 367,401			
6	$11,093,030							[illegible]	$98,211,111	($9,936 740)	($1,156,290)	10 0%
7	$11,425,821							[illegible]	$96,606 401	($9,821,111)	($1,604,710)	10 0%
8	$11,768,596							[illegible]	$94 498 445	($9,660,640)	($2,107,956)	10 0%
9	$12,121,654	[illegible]		[illegible]	[illegible]		[illegible]	($12,121,654)	$91,826 636	($9,449,845)	($2 671,809)	10 0%
10	$12,485,303	[illegible]		[illegible]	($3,302 640)		$12 485 303	($12 485,303)	$88,523,997	($9,182 664)	($3 302,640)	10 0%
11	$12,859,862	[illegible]		($8,852,400)	($4,007,463)	[illegible]	$12,859,862	($12,859,862)	$84,516,534	($8,852,400)	($4 007 463)	10 0%
12	$13 245,658	[illegible]	[illegible]	($8,451,653)	($4,794,005)	10 0%	$13,245,658	($13,245,658)	$79,722,529	($8,451,653)	($4,794 005)	10 0%
13	$13,643,028	[illegible]	[illegible]	($7,972,253)	($5,670,775)	10 0%	$13,643,028	($13 643,028)	$74,051,754	($7,972,253)	($5,670,775)	10 0%
14	$14,052 319	[illegible]	[illegible]	($7,405,175)	($6,647,143)	10 0%	$14 052,319	($14 052,319)	$67,404,610	($7,405,175)	($6 647,143)	10 0%
15	$14,473,888	[illegible]	$59,671,183	($6,740,461)	($7,733,427)	10 0%	$14,473,888	($14,473,888)	$59,671,183	($6,740,461)	($7,733,427)	10 0%
16	$14,908,105	[illegible]	$50,730,196	($5,967 118)	($8,940,987)	10 0%	$14,908,105	($14 908,105)	$50,730,196	($5,967,118)	($8,940 987)	10 0%
				[illegible]	($10,282,329)	10 0%					($10,282,329)	10 0%
				[illegible]	($11,771,222)	10 0%					($11,771,222)	10 0%
				[illegible]	($13,422,824)	10 0%					($13,422 824)	10 0%
				[illegible]	($15,253 821)	10 0%					($15,253 821)	10 0%

For any given year, the revenue requirement is identical, whether the asset is new or used.

$12,859,862

$12,859,862

5

Exhibit 5: ROI - DCF Versus Book Value Approaches

Year 1 Revenue Requirement	$9,568,945
Initial Investment	$100,000,000
Cost of Capital	10%
Inflation Rate	3%

DCF Return of Investment Pattern

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0			$100,000,000			
1	$9,568,945	($9,568,945)	$100,431,055	($10,000,000)	$431,055	10.0%
2	$9,856,014	($9,856,014)	$100,618,146	($10,043,105)	$187,092	10.0%
3	$10,151,694	($10,151,694)	$100,528,267	($10,061,815)	($89,879)	10.0%
4	$10,456,245	($10,456,245)	$100,124,849	($10,052,827)	($403,418)	10.0%
5	$10,769,932	($10,769,932)	$99,367,401	($10,012,485)	($757,447)	10.0%
6	$11,093,030	($11,093,030)	$98,211,111	($9,936,740)	($1,156,290)	10.0%
7	$11,425,821	($11,425,821)	$96,606,401	($9,821,111)	($1,604,710)	10.0%
8	$11,768,596	($11,768,596)	$94,498,445	($9,660,640)	($2,107,956)	10.0%
9	$12,121,654	($12,121,654)	$91,826,636	($9,449,845)	($2,671,809)	10.0%
10	$12,485,303	($12,485,303)	$88,523,997	($9,182,664)	($3,302,640)	10.0%
11	$12,859,862	($12,859,862)	$84,516,534	($8,852,400)	($4,007,463)	10.0%
12	$13,245,658	($13,245,658)	$79,722,529	($8,451,653)	($4,794,005)	10.0%
13	$13,643,028	($13,643,028)	$74,051,754	($7,972,253)	($5,670,775)	10.0%
14	$14,052,319	($14,052,319)	$67,404,610	($7,405,175)	($6,647,143)	10.0%
15	$14,473,888	($14,473,888)	$59,671,183	($6,740,461)	($7,733,427)	10.0%
16	$14,908,105	($14,908,105)	$50,730,196	($5,967,118)	($8,940,987)	10.0%
17	$15,355,348	($15,355,348)	$40,447,868	($5,073,020)	($10,282,329)	10.0%
18	$15,816,009	($15,816,009)	$28,676,646	($4,044,787)	($11,771,222)	10.0%
19	$16,290,489	($16,290,489)	$15,253,821	($2,867,665)	($13,422,824)	10.0%
20	$16,779,204	($16,779,204)	$0	($1,525,382)	($15,253,821)	10.0%

Depreciated Original Cost Return of Investment Pattern

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0			$100,000,000			
1	$9,568,945	($15,000,000)	$95,000,000	($10,000,000)	($5,000,000)	4.6%
2	$9,856,014	($14,500,000)	$90,000,000	($9,500,000)	($5,000,000)	5.1%
3	$10,151,694	($14,000,000)	$85,000,000	($9,000,000)	($5,000,000)	5.7%
4	$10,456,245	($13,500,000)	$80,000,000	($8,500,000)	($5,000,000)	6.4%
5	$10,769,932	($13,000,000)	$75,000,000	($8,000,000)	($5,000,000)	7.2%
6	$11,093,030	($12,500,000)	$70,000,000	($7,500,000)	($5,000,000)	8.1%
7	$11,425,821	($12,000,000)	$65,000,000	($7,000,000)	($5,000,000)	9.2%
8	$11,768,596	($11,500,000)	$60,000,000	($6,500,000)	($5,000,000)	10.4%
9	$12,121,654	($11,000,000)	$55,000,000	($6,000,000)	($5,000,000)	11.9%
10	$12,485,303	($10,500,000)	$50,000,000	($5,500,000)	($5,000,000)	13.6%
11	$12,859,862	($10,000,000)	$45,000,000	($5,000,000)	($5,000,000)	15.7%
12	$13,245,658	($9,500,000)	$40,000,000	($4,500,000)	($5,000,000)	18.3%
13	$13,643,028	($9,000,000)	$35,000,000	($4,000,000)	($5,000,000)	21.6%
14	$14,052,319	($8,500,000)	$30,000,000	($3,500,000)	($5,000,000)	25.9%
15	$14,473,888	($8,000,000)	$25,000,000	($3,000,000)	($5,000,000)	31.6%
16	$14,908,105	($7,500,000)	$20,000,000	($2,500,000)	($5,000,000)	39.6%
17	$15,355,348	($7,000,000)	$15,000,000	($2,000,000)	($5,000,000)	51.8%
18	$15,816,009	($6,500,000)	$10,000,000	($1,500,000)	($5,000,000)	72.1%
19	$16,290,489	($6,000,000)	$5,000,000	($1,000,000)	($5,000,000)	112.9%
20	$16,779,204	($5,500,000)	$0	($500,000)	($5,000,000)	235.6%

Exhibit 5: ROI - DCF Versus Book Value Approaches

Under DCF Approach ROI is stable, at 10% per year.

Note that at the midpoint of the asset's life, ROI appears to exceed cost of capital.

Year 1 Revenue Requirement	$9,568,945
Initial Investment	$100 000 000
Cost of Capital	10%
Inflation Rate	3%

DCF Return of Investment Pattern

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0			$100,000,000			
1	$9,568 945	($9 568,945)	$100,431,055	($10,000,000)	$431,055	10 [illegible]
2	$9,856,014	($9,856,014)	$100,618,146	($10,043,105)	$187,092	10 0%
3	$10 151 694	($10 151,694)	$100,528,267	($10,081,815)	($89,879)	10 0%
4	$10,456,245	($10,456,245)	$100,124,849	($10,052,827)	($403,418)	10 0%
5	$10 769 932	($10,769,932)	$99 367 401	($10,012,485)	($757,447)	10 0%
6	$11 093,030	($11,093,030)	$98,211,111	($9,936,740)	($1,156,290)	10 0%
7	$11,425,821	($11,425 821)	$96,606 401	($9,821,111)	($1,604,710)	10 [illegible]
8	$11,768,596	($11,768,596)	$94,498,445	($9,660,640)	($2,107,956)	[illegible]
9	$12 121 654	($12,121 654)	$91 826,636	($9,449,845)	($2,671,809)	[illegible]
10	$12,485,303	($12,485,303)	$88,523,997	($9,182 664)	($3,302,640)	[illegible]
11	$12,859,862	($12,859,862)	$84,516,534	($8,852,400)	($4,007,4[illegible]	[illegible]
12	$13,245,658	($13,245,658)	$79,722,529	($8,451,653)	($4,794[illegible]	[illegible]%
13	$13,643,028	($13,643,028)	$74,051 754	($7,972,253)	($5,[illegible]	[illegible]0%
14	$14,052,319	($14,052,319)	$67,404,610	($7,405,175)	[illegible]	[illegible]0 0%
15	$14,473,888	($14,473,888)	$59 671,183	($6,740,461)	[illegible]	10 0%
16	$14,908,105	($14,908,105)	$50,730,196	($5,967,1[illegible]	[illegible]	10 0%
17	$15,355,348	($15,355,348)	$40,447,868	($5,073[illegible]	[illegible]	10 0%
18	$15,816 009	($15,816,009)	$28,676,646	($4 0[illegible]	[illegible]	10 0%
19	$16,290 489	($16,290,489)	$15,253 821	($[illegible]	[illegible]4)	10 0%
20	$16,779 204	($16,779,204)	$0	[illegible]	[illegible]21)	10 0%

Depreciated Original [illegible]n of Investment Pa[illegible]

Year	Revenues	Payment	Principal	Return[illegible] Capital	[illegible]tion	ROI
0			$100,000,000			
1	$9,568 945	($15,000,000)	$95 000 000	($10 000,000)	[illegible]	4 6%
2	$9,856,014	($14,500,000)	$90,000,000	($9,500,000)	[illegible]	5 1%
3	$10 151,694	($14,000,000)	$85 000,000	($9 000,000)	($5,0[illegible]	5 7%
4	$10,456,245	($13 500,000)	$80,000,000	($8,500,000)	($5,000[illegible]	6 4%
5	$10,769,932	($13,000,000)	$75,000,000	($8,000,000)	($5,000,0[illegible]	7 2%
6	$11,093,030	($12,500,000)	$70 000,000	($7,500,000)	($5,000 00[illegible]	8 1%
7	$11,425,821	($12,000,000)	$65,000,000	($7 000 000)	($5,000 000)	9 2%
8	$11,768,596	($11,500,000)	$60 000,000	($6,500,000)	($5,000,000)	10 4%
9	$12,121 654	($11,000,000)	$55 000 000	($6 000,000)	($5 000,000)	[illegible]1 9%
10	$12,485,303	($10,500,000)	$50,000,000	($5,500,000)	($5 000,000)	13 6%
11	$12,859,862	($10,000,000)	$45,000,000	($5,000,000)	($5,000,000)	15 7%
12	$13,245,658	($9,500,000)	$40,000,000	($4,500,000)	($5,000,000)	18 3%
13	$13,643 028	($9,000,000)	$35,000 000	($4 000,000)	($5,000,000)	21 6%
14	$14,052,319	($8,500,000)	$30,000,000	($3,500,000)	($5,000,000)	25 9%
15	$14,473,888	($8,000,000)	$25 000,000	($3 000,000)	($5,000 000)	31 6%
16	$14,908,105	($7,500,000)	$20,000,000	($2,500,000)	($5,000,000)	39 6%
17	$15,355,348	($7,000,000)	$15,000,000	($2,000,000)	($5,000,000)	51 8%
18	$15 816 009	($6,500,000)	$10,000,000	($1,500,000)	($5,000,000)	72 1%
19	$16,290,489	($6,000,000)	$5,000,000	($1,000,000)	($5,000 000)	112 9%
20	$16,779,204	($5,500,000)	$0	($500,000)	($5,000,000)	235 6%

Under book value approach, the carrier would need to earn $15,000,000 Year 1 in order generate a 10% ROI, yet competition would constrain revenues to $9,568,945

ROI begins at levels below the cost of capital and increases to levels well above the cost of capital, even though over the life of the asset revenues just yield an ROI equal to the cost of capital

$$\text{*ROI} = \frac{\text{Revenues + Depreciation}}{\text{Prior Year Principle}}$$

6

Exhibit 6: Revenue Requirements – Nominal Versus Real Cost of Capital

Year 1 Revenue Requirement	$9 568 945
Initial Investment	$100,000 000
Cost of Capital	10%
Inflation Rate	3%
Real Cost of Capital	6 8% *

Nominal Cost of Capital

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0	$9 290 238		$100 000,000			
1	$9,568 945	($9,568 945)	$100 431,055	($10,000,000)	$431,055	10 0%
2	$9.856,014	($9,856,014)	$100,618,148	($10 043,105)	$187 092	10 0%
3	$10 151 694	($10,151,694)	$100,528,267	($10 061,815)	($89 879)	10 0%
4	$10 456 245	($10,456,245)	$100 124 849	($10 052,827)	($403 418)	10 0%
5	$10 769,932	($10,769,932)	$99 367 401	($10,012,485)	($757,447)	10 0%
6	$11,093 030	($11,093,030)	$98,211,111	($9,936,740)	($1,156,290)	10 0%
7	$11 425,821	($11,425,821)	$96 606 401	($9,821,111)	($1,604 710)	10 0%
8	$11 768 596	($11 768,596)	$94 498,445	($9,660 640)	($2 107 956)	10 0%
9	$12 121 654	($12,121 654)	$91 826,836	($9 449,845)	($2,671,609)	10 0%
10	$12 485,303	($12 485,303)	$88,523 997	($9,182,684)	($3,302 840)	10 0%
11	$12 859 862	($12 859 862)	$84 516,534	($8 852 400)	($4,007,463)	10 0%
12	$13 245,658	($13,245 658)	$79 722 529	($8 451,653)	($4 794,005)	10 0%
13	$13,643,028	($13,643,028)	$74 051 754	($7,972,253)	($5 670,775)	10 0%
14	$14,052 319	($14,052,319)	$67,404,610	($7,405,175)	($6,647,143)	10 0%
15	$14 473,888	($14,473,888)	$59,671 183	($6,740,461)	($7,733 427)	10 0%
16	$14 908 105	($14,908,105)	$50 730 196	($5,967 118)	($8 940 987)	10 0%
17	$15,355 348	($15,355,348)	$40 447 868	($5,073,020)	($10 282,329)	10 0%
18	$15,816,009	($15 816 009)	$28,676,646	($4,044 787)	($11 771,222)	10 0%
19	$16,290 489	($16,290,489)	$15,253 621	($2,867,665)	($13 422 824)	10 0%
20	$16 779 204	($16,779,204)	$0	($1,525 362)	($15 253 621)	10 0%

Real Cost of Capital

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0	$9 290 238		$100 000 000			
1	$9,290 238	($9,290,238)	$97 505,878	($6,796 117)	($2 494,122)	6 8%
2	$9.290,238	($9,290,238)	$94 842 253	($6,626,613)	($2,663 625)	6 8%
3	$9 290 238	($9,290,238)	$91 997,605	($6,445 590)	($2,844 648)	6 8%
4	$9,290,238	($9 290 238)	$88 959 631	($6,252,264)	($3.037,974)	6 8%
5	$9,290 238	($9,290,238)	$85 715,193	($6,045 800)	($3 244 438)	6 8%
6	$9 290,238	($9 290,238)	$82,250,259	($5,825,304)	($3 464,934)	6 8%
7	$9,290 238	($9,290,238)	$78 549 845	($5,589,823)	($3 700 415)	6 8%
8	$9 290 238	($9,290 238)	$74 597 945	($5 338 339)	($3 951,899)	6 8%
9	$9 290 238	($9 290,238)	$70,377,470	($5 069,763)	($4,220,475)	6 8%
10	$9,290 238	($9,290,238)	$65 870 167	($4,782,935)	($4 507,303)	6 8%
11	$9,290 238	($9,290,238)	$61 056,542	($4,476 613)	($4,813,625)	6 8%
12	$9,290 738	($9 290 238)	$55 915 778	($4 149 474)	($5 140 764)	6 8%
13	$9,290 238	($9,290 238)	$50 425,641	($3,800,101)	($5,490 137)	6 8%
14	$9,290,238	($9,290,238)	$44 562 388	($3,426 985)	($5,863,253)	6 8%
15	$9 290 238	($9,290 238)	$38 300,662	($3,028 512)	($6,261 726)	6 8%
16	$9 290 238	($9,290,238)	$31,613,381	($2 602 958)	($6,687,281)	6 8%
17	$9 290 238	($9,290,238)	$24,471 625	($2 148 482)	($7 141 756)	6 8%
18	$9 290,238	($9,290,238)	$16 844,507	($1,663,120)	($7,627,118)	6 8%
19	$9 290 238	($9,290,238)	$8,699 041	($1 144 772)	($8,145 466)	6 8%
20	$9 290 238	($9 290 238)	$0	($591 197)	($8 699,041)	6 8%

$$* \text{ Real Cost of Capital} = 6.8\% = \left[\frac{1.10}{1.03}\right] - 1$$

Exhibit 6: Revenue Requirements – Nominal Versus Real Cost of Capital

Year 0 revenue requirement is identical

Year 1 Revenue Requirement	$9 568,945
Initial Investment	$100 000 000
Cost of Capital	10%
Inflation Rate	3%
Real Cost of Capital	6 8% *

Nominal Cost of Capital

$9,290,238

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0	$9 290 238		$100 000 000			
1	$9 568 945	($9 568,945)	$100 431 055	($10,000,000)	$431 055	10 0%
2	$9.856.014	($9,856,014)	$100,618 146	($10,043,105)	$187,092	10 0%
3	$10 151 694	($10,151 694)	$100,528 267	($10 081 815)	($89 879)	10 0%
4	$10 456,245	($10,456,245)	$100 124 849	($10,052.827)	($403,418)	10 0%
5	$10 769 932	($10 769,932)	$99 367 401	($10,012 485)	($757 447)	10 0%
6	$11,093,030	($11,093 030)	$98,211,111	($9 936 740)	($1 156,290)	10 0%
					($1,604,710)	10 0%
					($2 107,856)	10 0%
					($2,671,809)	10 0%
					($3,302,640)	10 0%
					($4,007,483)	10 0%
					($4 794 005)	10 0%
					($5 670,775)	10 0%
					($6,647,143)	10 0%
15	$14,473 888	($14 473,888)	$59 671 183	($8 740 481)	($7 733,427)	10 0%
16	$14 908 105	($14 908 105)	$50 730 196	($5 967 118)	($8 940,987)	10 0%
17	$15,355 348	($15,355,348)	$40,447,868	($5,073,020)	($10 282,329)	10 0%
18	$15 816 009	($15 816,009)	$28 676,646	($4,044 787)	($11 771,222)	10 0%
19	$16,290 489	($16 290,489)	$15,253 821	($2,867,685)	($13 422,624)	10 0%
20	$16 779 204	($16,779,204)	$0	($1,525 387)	($15 253 821)	10 0%

Real Cost of Capital

$9,290,238

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0	$9 290 238		$100 000 000			
1	$9 290 238	($9 290 238)	$97 505 878	($6,796,117)	($2 494,122)	6 8%
2	$9 290 238	($9 290,238)	$94.842,253	($6,626 613)	($2,663,625)	6 8%
3	$9 290 238	($9,290 238)	$91 997 605	($6 445,590)	($2 844,648)	6 8%
4	$9 290 238	($9,290 238)	$88 959 631	($6,252,264)	($3 037 974)	6 8%
5	$9 290 238	($9,290,238)	$85 715 193	($6 045,800)	($3 244 438)	6 8%
6	$9,290,238	($9 290 238)	$82 250,259	($5 825,304)	($3 464,934)	6 8%
					,700,415)	6 8%
					,951,899)	6 8%
					,220 475)	6 8%
					,507 303)	6 8%
					,813 825)	6 8%
					,140 784)	6 8%
					,490 137)	6 8%
					863,253)	6 8%
15	$9 290,238	($9,290,238)	$38,300,862	($3,028,512)	($6 261 726)	6 8%
16	$9,290 238	($9 290 238)	$31 613 381	($2 802 958)	($6,687 281)	6 8%
17	$9,290,238	($9,290 238)	$24 471,625	($2,148 482)	($7 141,756)	6 8%
18	$9,290 238	($9,290,238)	$16,644,507	($1 663 120)	($7,627,118)	6 8%
19	$9,290 238	($9 290 238)	$8 899 041	($1,144,772)	($8 145 468)	6 8%
20	$9 290 238	($9,290 238)	$0	($581 197)	($8,899,041)	6 8%

$$* \text{ Real Cost of Capital} = 6.8\% = \left[\frac{1.10}{1.03}\right] - 1$$

Exhibit 6: Revenue Requirements – Nominal Versus Real Cost of Capital

Year 1 Revenue Requirement	$9 568 945
Initial Investment	$100 000 000
Cost of Capital	10%
Inflation Rate	3%
Real Cost of Capital	6 8%*

Year 0 revenue requirement is identical

Nominal Cost of [illegible]

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0	$9 290,238		$100 000 000			
1	$9 568,945	($9 568,945)	$100 431 055	($10,000,000)	$431 055	10 0%
2	$9,856 014	($9,856 014)	$100 618,146	($10 043,105)	$187 092	10 0%
3	$10 151,694	($10,151,694)	$100 528 287	($10,081,815)	($89,879)	10 0%
4	$10 456 245	($10 456 245)	$100 124 849	($10,052,827)	($403 418)	10 0%
5	$10,769 932	($10 769,932)	$99.367 401	($10 012 485)	($757 447)	10 0%
6	$11,093,030	($11,093,030)	$98,211 111	($9,936 740)	($1,156 290)	10 0%
7	[illegible]	($11 425,821)	$96 606 401	($9,821 111)	($1 604,710)	10 0%
8	[illegible]	($11 768 596)	$94 498 445	($9 660,640)	($2,107 956)	10 0%
9	[illegible]	($12 121,654)	$91 826 636	($9 449 845)	($2,671,809)	10 0%
10	[illegible]	($12 485,303)	$88,523,997	($9 182,664)	($3,302,640)	10 0%
11	[illegible]	([illegible]2,859,862)	$84 516 534	($8,852 400)	($4 007 463)	10 0%
12	[illegible]	([illegible]245 658)	$79 722,529	($8 451,653)	($4 794 005)	10 0%
[illegible]	[illegible]	([illegible]028)	$74 051 754	($7 972 253)	($5 670,775)	10 0%
[illegible]	[illegible]	[illegible]	$67 404 610	($7 405 175)	($6,647 143)	10 0%

Real Cost of Capital

Year	Revenues	Payment	Principal	Return on Capital	Depreciation	ROI
0	$9 290 238		$100 000 000			
1	$9 290 238	($9 290 238)	$97 505.878	($6,796 117)	($2 494,122)	6 8%
2	$9 290 238	($9,290 238)	$94,642,253	($6,626 613)	($2,663,625)	6 8%
3	$9 290 238	($9 290 238)	$91,997,605	($6,445,590)	($2 644,648)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]7 974)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]4 436)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]4 934)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]0 415)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]1,889)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]0 475)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]7,303)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]3,625)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]0 764)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]0,137)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]3,253)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]1 726)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]7 281)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]1 756)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]7 118)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]5 486)	6 8%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	([illegible]9,041)	6 8%

In any given year, the nominal revenue requirement equals the real revenue requirement, multiplied by the cumulative effect of inflation. Thus in Year 1, $9,568,945 = $9,290,238 X (1.03)^1$

In Year 6, $11,093,030 = $9,290,238 X (1.03)^6$

$9,568,945
$9,856,014
$10,151,694
$10,456,245
$10,769,932
$11,093,030

$$\text{* Real Cost of Capital} = 6.8\% = \left[\frac{1.10}{1.03}\right] - 1$$

BARANOWSKI

VERIFIED STATEMENT

OF

MICHAEL R. BARANOWSKI

May 1, 2008

TABLE OF CONTENTS

I. INTRODUCTION AND OVERVIEW

My name is Michael R. Baranowski. I am a Senior Managing Director of FTI Consulting. My business address is 1101 K Street, NW, Washington, DC 20005. As Senior Managing Director, I provide a wide range of economic and consulting services, primarily to clients in the transportation and telecommunications industries.

I have submitted written expert testimony before the Interstate Commerce Commission and its successor the Surface Transportation Board, the Federal Communications Commission, Federal Court, arbitration proceedings and a number of state agencies. A complete listing of my prior testimony is included in my curriculum vitae, included as Exhibit 1 to this report.

I have been asked by the Association of American Railroads (AAR) to develop a methodology to estimate replacement costs for BNSF, CSXT, NS and UP using, where applicable, the replacement cost methodology outlined by the Board in its Simplified Stand-Alone Cost (SSAC) procedures as described in its decision in Ex Parte 646 (Sub-No. 1), Simplified Standards for Rail Rate Cases.[1] For some asset categories or accounts not covered specifically by the Ex Parte 646 SSAC procedures, I have been asked to develop approaches to the development of replacement costs that are generally consistent with the SSAC procedures. As I will describe in more detail in the sections below, some of these alternate approaches are still under development.

I have also been asked to help develop an alternative to the Board's current revenue adequacy determinations that uses replacement costs as the basis for determining the annual revenue requirement needed to attain revenue adequacy In conjunction with Professor Kalt and

[1] STB Ex Parte No. 646 (Sub-No 1), *Simplified Standards For Rail Rate Cases*, (served September 5, 2007) ("Ex Parte 646" or "EP 646").

John Klick, I made minor modifications to the Board's current SSAC discounted cash flow (DCF) model in order to compute an annual revenue requirement that covers the return of investment, return on investment and an allowance for Federal and state income tax payments at replacement cost levels. I also enhanced the SSAC DCF model to allow the Board, if it so desires, to calculate the cost of capital actually earned for a given revenue requirement and set of replacement costs.[2]

Finally I was asked to identify adjustments to be made to the Board's computations of net railway operating income (NROI) for its revenue adequacy determinations to render the NROI figure comparable to the DCF based annual revenue requirement.[3]

The results of my replacement cost calculations and modifications to the Board's revenue adequacy determinations for BNSF, CSXT, NS and UP are summarized in Table 1.

Table 1
Summary of Alternate Revenue Adequacy Results
2006

Methodology	2006 Industry Cost of Capital	Calculated Returns BNSF	UP	NS	CSXT
STB DCF Expressed as a Revenue Requirement ($ millions):					
Revenue Requirement		$8,377 2	$9,720.7	$6,844 6	$6,720 1
Modified Net Operating Income		4,659 6	4,162 1	3,194 3	2,451 0
Shortfall		$3,717 6	$5,558.6	$3,650 3	$4,269 1
SSAC-Based Replacement Costs:					
STB DCF Expressed as a Return on Investment	9 94%	6.04%	4 83%	5 50%	4 36%

[2] Specifically, a second iterative process was built into the DCF model that adjusts the cost of capital within the DCF model until the calculated year one revenue requirements is equal to net operating income. An explanation of the steps required to invoke these calculations are set forth in the "Investment SAC" tab of the DCF model included in my work papers.

[3] I refer to the number to which the revenue requirement generated from the DCF is compared as "modified net operating income."

II. METHODOLOGY FOR CALCULATING REPLACEMENT COST INPUTS INTO DCF

Appendix A to the Board's September 2007 decision in Ex Parte 646 describes, by major railroad asset category, the methodology proposed by the Board to calculate replacement costs for the portion of an incumbent railroad's system necessary to serve the traffic at issue in a SSAC-based rate complaint. Basically, the Board proposes to use unit costs from the six most recent full stand-alone rate reasonableness proceedings to develop average composite unit costs for SSAC. A summary of the major SSAC asset categories and the railroad road property accounts they encompass are set forth in Table 2.

Table 2
SSAC Major Asset Groupings and Associated Property Accounts

Ex Parte 646 Asset Category	Road Property Account Number	Account Description
Roadbed Preparation	3	Grading
	4	Other right-of-way expenditures
Tunnels	5	Tunnels and subways
Bridges / Culverts	6	Bridges, trestles and culverts
Track	8	Ties
	9	Rail and other track material
	11	Ballast
Signals & Communication	26	Communications systems
	27	Signals and interlockers
Buildings & Facilities	16	Station and office buildings
	17	Roadway buildings
	19	Fuel stations
	20	Shops and enginehouses
	22	Storage warehouses
	44	Shop machinery
Public Improvements	13	Fences, snowsheds and signs
	39	Public improvements – construction
Mobilization, Engineering & Contingencies		Distributed across asset categories

For these asset categories, the SSAC procedures were applied as described in more detail below Overall, replacement costs calculated based directly on the Board's SSAC procedures represent over 82 percent of total calculated replacement costs

The Board has also proposed in Ex Parte 646 a procedure for computing replacement values for land. However, the application of those SSAC procedures for valuing the replacement cost of land presents practical difficulties when applied to a railroad's entire network. The Board's SSAC proposal for land involves the classification of the right-of-way and yard acreage into one of four categories. While such an exercise is straightforward in the context of a comparably short SSAC issue traffic route, it presents more of a challenge when done on a system-wide basis.

In addition to the railroad assets described thus far, there are a number of other railroad asset categories for which the Board did not provide a SSAC replacement cost methodology. These asset categories fall into two general groups. The first group covers equipment accounts and roadway machines. The Board's SSAC rules rely on a version of its Uniform Rail Costing System (URCS) model to develop SSAC-based costs for these items. As such, there are no specific prescriptions for computing replacement costs for this group. The second group incorporates road property assets that have not previously been considered in the six prior Full-SAC cases used by the Board to compute average replacement unit costs and are thus not counted in any way under the Board's SSAC procedures. These include items such as intermodal and auto ramp facilities and a variety of smaller road asset accounts

As set forth in the sections below, for certain assets within each group, the AAR has either developed or is in the process of refining proposals to compute replacement costs in a manner comparable to those developed by the Board in Ex Parte 646 The remainder of the assets, upon which the railroads under the revenue adequacy guidelines are entitled to earn a return, are included at gross book value as a proxy for the replacement cost of those assets Assets accounted for at gross book value comprise only 1.5 percent of total replacement costs.

A. Asset Categories for Which the Board Provided a Methodology in EP 646

In this section I described the specific application of the Board's SSAC replacement cost guidelines to the relevant system-wide railroad asset groups.

1. Roadbed Preparation (Grading)

In Ex Parte 646, the Board determined that the cost of Roadway Preparation should be calculated on a two component basis. One component is based on cubic yards of excavation and the other is based on route miles.

a. Cubic Yard Component

The cubic yard component of roadbed preparation represents the cubic yards of earthwork required to form the roadbed Similar to the process used in Full-SAC cases, the Board's proposal assumes different inputs and assumptions for main and yard and siding track categories.

(1) Main Tracks

The Board's replacement cost proposal for earthwork begins with earthwork quantities reported in the ICC Valuation Engineering Reports, adjusts those quantities to reflect modern day construction standards and the current mix of additional mainline tracks to route miles and applies units costs derived from RS Means to those adjusted quantities. Because the assimilation of Engineering Report data for each railroad's predecessor roads and aligning those data with today's line segmentation for the entire system represents a significant effort, I limited my application of the Board's procedures to one eastern and one western carrier, CSXT and BNSF, respectively. Earthwork quantities for NS and UP were estimated base on the per mile quantities developed for CSXT and BNSF, respectively

The first step in developing earthwork replacement costs is to identify the predecessor roads to BNSF and CSXT and to gather the available Engineering Report data from the National

Archives. This process required extensive research since each present day railroad is comprised of numerous predecessors CSXT alone is made up of over thirty predecessor railroads. Both railroad supplied and publicly available data was utilized in identifying the predecessor railroads.

From there, the quantities of common, loose, solid and borrow excavation are drawn from the Engineering Reports, along with the reported main and other track miles and input to a spreadsheet developed by the Board for use in the Full-SAC proceedings. That spreadsheet includes a series of other inputs and formulas that are applied to the Engineering Report quantities to expand the historical earthwork cross section to reflect modern day construction specifications and to calculate quantities attributable to multiple track territory. The spreadsheet formulas assume that the modern day quantities would be comprised of the same mix of common, loose, solid and borrow that were reported at the time of the valuation study.

There are two inputs within the Board's earthwork calculation spreadsheet for which multiple values are typically used in Full-SAC cases, based on the specific details of each individual case. These are track spacing and roadbed width. Specifically, in Full-SAC cases, the present day track configuration includes spacing of double track on both 15 foot and 25 foot track centers. In my calculations I have used the lower 15 foot track center figure even though most railroads have segments with track centers greater than 15 feet. Similarly the standard roadbed width for single track can be either 24 feet or 28 feet, depending on the relative density of the line segment. I conservatively assumed the smaller roadbed width of 24 feet based in my development of system-wide earthwork quantities.

These adjusted quantities are then ascribed to individual line segments and multiplied by the miles of first main and multiple main track within each line segment to derive today's earthwork quantities This involved identifying from index maps obtained from the Archives for each predecessor railroad those valuation sections that are still in service today. Approximately 90 percent of today's line segments were identified in the process described above. For those line segments for which no Engineering Report information is available, either because the particular line segment was not in existence at the time the original ICC valuation was conducted or because the Engineering Report information for the predecessor road was not available from the Archives, I assigned surrogate historical segment data that had similar geographic and topographic characteristics.

Once earthwork quantities were developed for each BNSF and CSXT line segment, one final adjustment was required. Both BNSF and CSXT supplied inventories of their main track miles that varied slightly from the track mile totals that appeared in their respective Schedule 700 of the 2006 R-1 Annual Report Since the replacement study is based on assets in place as of the end of 2006, the calculated quantities were calibrated to reflect the main track miles as of the end of 2006 by applying the ratio of the inventory miles to R-1 miles.

(2) Way and Yard Switching Tracks

For calculating excavation for way and yard switching tracks, I used the methodology employed by the Board in Full-SAC cases. The Board's standard for way and yard switching track excavation assumes a roadbed width of 15 feet, an average depth of 1 foot and 1.5 to 1 side slopes. I computed earthwork attributable to way and yard switching track using these inputs and apportioned the resulting quantities into the four excavation categories based on the same percentages as the main track excavation. Way and yard switching track miles were obtained from Schedule 700 of the R-1 Annual Report for each railroad

(3) Earthwork Quantities and Costs

In Ex Parte 646, the Board calculated unit costs per cubic yard for each of the four earthwork categories based on the six most recently decided Full-SAC cases[4]. I indexed the Board's unit costs to 2006 and calculated an average unit cost for each category of earthwork. The replacement cost was calculated by multiplying the average category unit costs by the earthwork category cubic yards for each railroad. Table 3 shows the replacement cost of earthwork materials for each railroad.

Table 3
Replacement Cost of Earthwork Material ($millions)
Main and Switch Tracks

Railroad	Track Miles	Earthwork (CY)	Replacement Cost
BNSF	39,135	1,449,977,293	$12,380 2
CSXT	29,233	1,119,439,173	$6,999.3
NS	30,362	1,162,139,903	$7,269.2
UP	43,484	1,592,117,283	$13,613.6

b. Route Mile Component

In Ex Parte 646, the Board calculated unit cost for miscellaneous earthwork work items such as seeding and topsoil on a route mile basis. Once again the Board relied on its evidence from recently decided Full-SAC cases to derive unit costs I indexed the Board's unit costs to 2006 and calculated an average unit cost.

Route miles were obtained from Schedule 700 of the 2006 R-1 Annual Reports for each of the railroads. The replacement cost was calculated by multiplying the R-1 route miles by the indexed average cost per route mile for each railroad Table 4 shows the replacement cost of miscellaneous earthwork for each railroad.

[4] The September 5, 2007 Ex Parte 646 decision does not include data from the AEP Texas and Basin Electric decisions. Final decisions have not yet been issued in those cases

Table 4
Replacement Cost of Miscellaneous Earthwork ($millions)

Railroad	Route Miles	Replacement Cost
BNSF	23,090	$1,732.3
CSXT	16,529	$1,240.1
NS	16,562	$1,242.6
UP	26,537	$1,990.9

c. Total Replacement Cost of Roadbed Preparation

Table 5 shows the total replacement cost of Roadbed Preparation for each railroad.

Table 5
Replacement Cost of Roadbed Preparation ($millions)

Railroad	Route Miles	Track Miles	Replacement Cost
BNSF	23,090	39,135	$14,112.6
CSXT	16,529	29,233	$8,239.4
NS	16,562	30,362	$8,511.8
UP	26,537	43,484	$15,604.5

2. Tunnels

a. EP 646 Methodology

The STB did not specify a replacement cost methodology for Tunnels within Ex Parte No. 646 It simply mentions that the parties must submit evidence on the current replacement cost of a tunnel if a tunnel is on the ROW replicated by the SARR.

b. Inventory Received

For each of the four railroads, I received the tunnel location, length of each tunnel in linear feet, and the number of tracks in each tunnel

c. Process Used

Tunnel replacement costs are difficult to generalize because of variability in specific tunnel costs due to geological differences, soil conditions, method of tunneling, and the risks shared among various parties Data contained in prior Full-SAC cases and industry research in the planning, construction, and risk management of tunneling suggested that the cost per linear foot for single track tunnels is estimated at $6,000, and the cost per linear foot for multi track tunnels is estimated at $10,500. Work papers detailing the development of these averages are being filed with this testimony.

Tunnel replacement costs were developed by applying the estimated cost per single and multi-track tunnel linear foot to the number of linear feet of applicable tunnels provided by each carrier

Table 6
Replacement Cost for Tunnels ($millions)

Railroad	Units	Replacement Cost
BNSF	Single Track – 86 tunnels Multi Track – 3 tunnels	$1,104.0
CSXT	Single Track – 230 tunnels Multi Track – 48 tunnels	$1,901.8
NS	Single Track – 147 tunnels Multi Track – 24 tunnels	$1,220.8
UP	Single Track – 293 tunnels Multi Track – 8 tunnels	$1,997.9

3. Bridges

a. EP 646 Methodology

For bridges, EP 646 provided two methodologies for determining the replacement cost. The first methodology uses a cumulative average bridge cost per linear foot from prior rate cases, distinguished between Eastern and Western railroads and classified into three types of bridges. Under the first method, the following three classifications are outlined for Eastern and Western railroads:

Eastern Railroad

- Type 1 – Length between 10 and 40 feet
- Type 2 – Length between 41 and 75 feet
- Type 3 – Length greater than 75 feet

Western Railroad

- Type 1 – Pre-stressed concrete girder
- Type 2 – Steel deck plate girder
- Type 3 – Steel through plate girder

The second methodology states that a cost trend curve can be applied for bridges sharing local terrain characteristics of the Western bridges. This methodology is based on bridge length without consideration of design or height of bridge. It is also restricted to be used on bridges less than 350 feet in length. To develop bridge replacement costs I used the first method for both the Eastern and Western railroads.

b. Inventory Received

Each of the four railroads was asked to provide the following information bridge location, description of what is being crossed, bridge type (as outlined in three types above), number of spans, span length, total length, bridge height, and number of tracks.

c. Process Used

For the Eastern bridges, the replacement costs were calculated based on the lengths of the individual spans. The railroads provided lengths and bridge types at the individual span level, so to gain a more representative cost for replacement, I applied the costs per feet outlined in table A-6 (page 42 of STB Ex Parte No. 646) to the individual spans and associated lengths.

For the Western bridges, I worked with the Western railroads to confirm the bridge types (correlating to construction types) that were contained in their data files. Similar to the Eastern railroads, the Western railroads also provided lengths by individual span level. I applied the costs per feet outlined in table A-7 (page 43 of STB Ex Parte No. 646) to the individual spans and associated lengths.

Table 7
Replacement Cost for Bridges ($millions)

Railroad	Units	Replacement Cost
BNSF	Type 1 – 939,420 feet Type 2 – 756,114 feet Type 3 – 242,764 feet	$6,121.1
CSXT	Type 1 – 84,473 feet Type 2 – 121,931 feet Type 3 – 1,305,585 feet Type 1 (Other) 1,393 spans Type 2 (Other) 714 spans Type 3 (Other) 1,515 spans	$9,359.7
NS	Type 1 – 136,525 feet Type 2 – 194,297 feet Type 3 – 1,245,887 feet	$7,360.2
UP	Type 1 – 1,165,768 feet Type 2 – 550,576 feet Type 3 – 286,158 feet	$6,165.6

4. Culverts

a. EP 646 Methodology

Culvert costs were estimated using the rolling average culvert cost per linear foot from prior Full-SAC rate cases. One of three culvert types was assigned to each culvert in the railroads' inventories. The three culvert types from table A-9 (on page 44 of STB Ex Parte No. 646) are as follows:

- CMP – Corrugated Metal Pipe
- RCB – Reinforced Concrete Box
- SSP – Structural Steel Plate Pipe

The cross sectional area was calculated for each culvert. For CMP and SSP culverts, the cross sectional area is calculated in inches, and for RCB culverts, the cross sectional area is calculated in feet. The regression formulas listed in table A-9 were used to derive the dollars per linear foot for the culverts across the six prior Full-SAC cases. An average dollar per linear foot is derived for each culvert based on the prior six Full-SAC cases. This average dollar per linear foot is then multiplied by the length measurements provided in the inventories to calculate the replacement cost.

b. Inventory Received

Each of the four railroads was asked to provide the following information: culvert location, culvert type, culvert size, culvert length, and number of tracks crossed.

c. Process Used

Each railroad's inventory was scrutinized to ensure that I had a reasonable culvert type assigned to every record. The assigned types were sent back to the railroads for confirmation and further refinement where necessary. Cross sectional areas were calculated for each culvert type (for RCB types, the area was calculated as width times height; for CMP and SSP types, the area was calculated as π multiplied by the radius squared). Depending on the classification of culvert type, the various regression formulas listed in Ex Parte 646 Appendix A Table A-9 were used to determine the average dollars per square foot for each culvert This average was then multiplied by the length of culvert to calculate the replacement cost. In situations where the lengths were null or were listed as zero, I applied an average cost to these culverts based on the data contained in the known records.

Table 8
Replacement Cost for Culverts ($millions)

Railroad	Units	Replacement Cost
BNSF	CMP – 45,855 culverts RCB – 8,115 culverts SSP – 843 culverts Undetermined – 1,063 culverts	$497.9
CSXT	CMP – 11,454 culverts RCB – 7,515 culverts SSP – 292 culverts	$174.2
NS	CMP – 49,528 culverts RCB – 5,117 culverts SSP – 13,330 culverts Undetermined – 2,780 culverts	$525.0

UP	CMP – 41,935 culverts RCB – 14,852 culverts SSP – 2,756 culverts	$320.7

5. Track Excluding Ballast and Subballast

In Ex Parte 646, the Board decided that the cost of track, excluding ballast and subballast, should be valued on a track mile basis. Further, the Board decided that the unit cost for track should be based on a rolling average of the costs per track mile from previous Full-SAC cases. The Board removed the ballast and subballast components from the track investment because of the variability shown in prior Full-SAC cases due mainly to transportation cost of ballast and differences in the ratio of ballast to subballast. The replacement cost for ballast and subballast is addressed separately in this report

I have adhered to the Board's methodology in this analysis First, I calculated the track miles for each railroad based on information contained in Schedule 700 of the R-1 Annual Report. For this calculation, track miles include routes that are owned by the respondent railroad and do not include miles operated under trackage rights agreements. Where the respondent railroad had partial ownership of routes I modified the miles to reflect only the respondent's percentage of ownership.

As with other assets where I applied the Board's Ex Parte 646 methodology, the unit costs that appear in the decision have been indexed to reflect year 2006 costs. I then calculated a 2006 average cost per track mile and applied it to the railroad's track miles. Table 9 shows the replacement cost of track excluding ballast and sub ballast for each railroad.

Table 9
Track Replacement Cost excluding Ballast/Subballast (2006)

Railroad	Track Miles	Replacement Cost ($millions)
BNSF	39,135	$23,747.0
CSXT	29,233	$17,738.5
NS	30,362	$18,423.3
UP	43,484	$26,386.0

6. Ballast and Sub ballast

a. EP 646 Methodology

In STB Ex Parte No. 646, the Board states that ballast and subballast are excluded from track costs due to variability in prior cases (page 41). An alternative method was developed.

b. Process Used

I calculated a material component and a transportation component for ballast and subballast For the material component, I used the actual ballast and subballast costs (without transportation) as referenced in the six Full-SAC cases. Applying the track miles to these costs, I developed a cost per track mile, indexed this to 2006 levels, and applied the overall average to the total number of track miles per railroad system as stated in schedule 700 of the annual R-1 reports.

For the transportation component, I began by calculating the total tons of ballast and subballast used in the six prior Full-SAC cases. I generally took the total cost and divided by the cost per cubic yard to determine how many cubic yards were used. Multiplying the cubic yards by a factor of 1.5 provided the number of tons used in the Full-SAC cases. Applying the track miles from the cases to these volumes, I developed an average number of tons per track mile that was used. Multiplying this by the total number of track miles per railroad yielded the total tons transported for the replacement cost. I conservatively assumed an average length of haul of 50 miles[5] and a rate of transport per ton mile of $0.035 (taken from Arizona Public Service Company v. Atchison, Topeka and Santa Fe).[6] I calculated the cost to transport the ballast and subballast (tons of ballast & subballast transported times average length of haul times cost per mile to transport).

Table 10
Replacement Cost for Ballast/Subballast ($millions)

Railroad	Units	Replacement Cost
BNSF	Material Cost – $82,537 / track mile Tons Transported – 558,639,525	$4,207.7
CSXT	Material Cost – $82,537 / track mile Tons Transported 417,291,520	$3,143.1
NS	Material Cost – $82,537 / track mile Tons Transported – 433,400,680	$3,264.4
UP	Material Cost – $82,537 / track mile Tons Transported – 620,720,702	$4,675.3

7. Buildings / Facilities

a. EP 646 Methodology

STB Ex Parte No 646 calls for an estimation of the relationship between cost per ton and tonnage using a regression analysis of the costs from prior rate cases, as listed in table A-11 (page 47). Specifically, the Board has developed a regression formula that solves for a tonnage related cost coefficient based on the tonnage handled in each of the six Full-SAC cases

There are challenges with applying the Board's regression to a complete network. Unlike other major railroad account categories like grading, track and bridges that are generic and scalable, the building and facilities component in Full-SAC proceedings is tailored specifically to

[5] Determination of the average length of haul from the railroad ballast and subballast sources to placement in the track structure requires detailed studies that have not been conducted by the railroads. The 50 mile estimate assumes ballast and subballast sources every 200 miles along the right-of-way.

[6] STB Docket No. 41185, *Arizona Public Service Company and Pacificorp v. The Achison, Topeka and Santa Fe Railway Company*, (served July 29, 1997), at 33.

the characteristics of each stand-alone network. In this case, the six prior Full-SAC cases from which the SSAC buildings and facilities variables were derived were designed predominately to serve a single commodity – coal. As such, the supporting facilities are limited to only those necessary to support a predominately coal operation and not the diverse commodity and service mix of a major Class I railroad. Full-SAC investment, for example, does not include substantial and necessary railroad investments such as intermodal facility infrastructure or major automotive facilities.

In addition, the facilities required for the Full-SAC cases are not uniform across all cases and are dependent on a number of other Full-SAC inputs and assumptions. For example, depending on the route configuration and operating and cost assumptions, a Full-SAC case may or may not include investment for freight car repair facilities or major locomotive repair facilities

Finally, because the Full-SAC cases each cover a relatively small portion of the defendant railroad's overall volumes, the tonnage based coefficients are likely not representative of the system wide tonnage levels to which they are being applied. Because the system-wide tonnages for BNSF, CSXT, NS and UP are outside the relevant range of the SSAC regressions the economics of scale implicit in the regression formula are unlikely and inapplicable on a system-wide basis.

b. Process Used

To overcome certain of the limitations regarding the utility of the SSAC regression formula for estimating system-wide facility replacement costs, I made two modifications in its application. First, I assumed that the facilities covered by the SSAC replacement cost process would be limited to those included in the Full-SAC case. These are:

- Locomotive Repair Shop
- Fueling Facility
- Car Repair Shop

- Roadway Buildings
- Headquarters Facility
- Wastewater Treatment Plant
- Yard Site Development Cost

Facilities other than those listed above will be considered under Section II.D below.

Second, in an effort to overcome the mismatch between the tonnages used to develop the formulas and the system-wide tonnage levels, I modified the application of the regression formula to use the regression tonnage coefficient to compute the building and facility cost per ton associated with the highest tonnage Full-SAC case (Otter Tail) and applied that cost to the system-wide volume levels. While this alternative likely still understates the facilities replacement cost, it represents a conservative estimate for these purposes. Table 11 shows the Building and Facilities Replacement Cost for each of the railroads.

Table 11
Buildings and Facilities Replacement Cost ($millions)

Railroad	Replacement Cost
BNSF	$190.2
CSXT	$136.7
NS	$131.8
UP	$178 6

8. Signals and Communications

In the Ex Parte 646 decision, the Board calculated unit costs for signals and communications to be used in SSAC cases on a per route mile basis based on costs from previous Full-SAC cases. These costs reflect a mix of CTC and dark territory that is driven by the relative densities of the Full-SAC systems.

I have adopted the Board's methodology to calculate replacement cost of signals and communications. Class I railroads use a number of different train control systems depending on the amount and mix of traffic types traversing different segments of their systems. These range from complex CTC configurations and automatic block systems to dark territory under track warrant control. Most Full-SAC cases are either coal only or predominantly coal and require less sophisticated CTC systems that only have to deal with meets of opposing direction trains of equal priority. Conversely, Class I railroads move a mix of traffic with different priorities and not only have to deal with opposing direction traffic but also deal with higher priority trains passing lower priority trains. As such, the relatively straightforward applications that form the basis for Full-SAC case derived unit costs likely understate the cost of a typical Class I signal application and thus represent a conservative approximation of signal system replacement costs.

Capital expenditures for communication systems are a function of territory coverage, traffic mix and the number and type of individuals with communication needs. As with signals, the communication system replacement cost per route mile approach advocated by the Board for SSAC represents a conservative estimate of the full system communication system replacement cost

I employed the Board's Ex Parte 646 methodology in my calculation of the replacement cost of signals and communications for each railroad. First, I indexed the Ex Parte 646 unit costs to reflect 2006 costs. Second, I calculated an average of the 2006 indexed unit cost per route mile. Finally, I multiplied the weighted average unit cost per route mile by each railroad's route miles Route miles were derived from Schedule 700 of the R-1 Annual Reports. The route miles have been adjusted to reflect partial ownership of lines and do not include trackage rights miles. Table 12 shows the replacement cost for signals and communication assets.

Table 12
Signals and Communications ($millions)

Railroad	Route Miles	Replacement Cost
BNSF	23,090	$4,128.0
CSXT	16,529	$2,954.9
NS	16,562	$2,961.0
UP	26,537	$4,744.2

9. Public Improvements

a. EP 646 Methodology

The two asset descriptions that fall within this category are (1) Public Improvements – Construction and (2) Fences, Snow Sheds and Signs. STB Ex Parte No. 646 identifies separate methodologies for estimating Public Improvement costs with and without Grade Separations. A Grade Separation is where a rail line crosses a road using either an overpass or an underpass (EP 646, page 47)

For Public Improvements without Grade Separations, the Board requires using the rolling-average public improvement cost per route mile from prior Full-SAC rate cases (table A-12 on page 47 of EP 646). For the Grade Separated Crossings, the Board proposes a weighted cost per separation based on prior Full-SAC proceedings (table A-13 on page 48 of EP 646)

The Board has also accepted 10% of the cost of constructing Grade Separations in past Full-SAC cases where the railroads have demonstrated some contribution to the investment in those separations. In Full-SAC cases, where the railroad supplied a list of Grade Separations that the railroad owns and maintains the Board accepted 100% of the construction cost.

b. Inventory Received

Each of the four railroads was asked to provide the following information for their Grade Separated Crossings: crossing location, bridge construction type, width or number of highway lanes, length, and number of tracks crossed Both NS and BNSF supplied inventories for those structures that are both owned and maintained by them. CSXT and UP supplied inventories that included all structures regardless of ownership

c. Process Used

For the Public Improvements without Grade Separations, I applied the cost per route mile listed in table A-12 to the route miles for each railroad from schedule 700 of the annual R-1 reports. This included the replacement costs applicable for the fences, snow sheds and signs.

For the Grade Separated Crossings, the first task was to count the number of separations provided by each railroad. Multi-span crossings were counted as one separation. Once I obtained the number of crossings, I multiplied this by the indexed cost per separation to calculate the replacement cost. Since BNSF and NS supplied inventories that included only those separations that they owned and maintained I applied 100% of the Ex Parte derived cost. The Board's "10 percent" methodology was applied to the CSXT and UP inventories since they included all separations regardless of their ownership.

Table 13
Total Public Improvements Replacement Cost ($millions)

Railroad	Units	Replacement Cost
BNSF	Cost per Route Mile (w/out separation) - $25,585 Number of Separations – 668	$1,089.5
CSXT	Cost per Route Mile (w/out separation) - $25,585 Number of Separations – 255	$613 1
NS	Cost per Route Mile (w/out separation) - $25,585 Number of Separations – 353	$687.3
UP	Cost per Route Mile (w/out separation) - $25,585 Number of Separations – 401	$978.0

10. Mobilization, Engineering & Contingencies

a. EP 646 Methodology

Mobilization is calculated at 3 5% of the following categories: road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, and public improvements. Engineering is calculated at 10% of these same categories. Contingencies are calculated at 10% of the same categories as above, plus 10% of the Mobilization and Engineering costs. This is the same process that I followed

Table 14
Total Mobilization, Engineering & Contingencies ($millions)

Railroad	Mobilization, Engineering & Contingencies
BNSF	$13,716.7
CSXT	$10,998.9
NS	$10,706.8
UP	$15,171.1

B. Asset Categories for which the Methodology Provided by the Board in EP 646 Presents Practical Difficulties When Applied to an Entire Network

1. Land for Transportation Purposes

In the Ex Parte 646 decision, the Board decided that land will be valued based on per acre average costs from the prior Full-SAC rate cases. Instead of using one cost per acre the Board uses four different costs based on land use category. Agricultural, residential, industrial and commercial are the four land use categories that the Board uses to calculate the cost of acquiring land. While railroads do not normally classify land into the Board's four categories, the Board's replacement cost approach for land is straightforward in relatively small SSAC cases. However, I concluded that it would be difficult at this time to pursue such categorization for railroad systems that cover territories in excess of fifteen-thousand miles and I have not followed the Board's Ex Parte 646 methodology in this analysis. Instead, for purposes of the analysis I present here, I have used the book investment for land that appears in Schedule 330 of the R-1 Annual Report. This is a conservative methodology since the gross investment reflects either the original cost of the land or the value of the land based on the purchase price of acquired railroads. In both cases, the value of the land has appreciated. Table 15 shows the replacement cost for land for each railroad.

Table 15
Land Replacement Cost (2006)

Railroad	Replacement Cost ($million)
BNSF	$1,694.2
CSXT	$1,757.7
NS	$1,971 2
UP	$4,614.1

C. Asset Categories for Which There is No Specific SSAC Replacement Cost Proposal for Which the AAR is Proposing a Methodology

As noted previously, there are some asset categories for which the Board's SSAC procedures do not themselves include a replacement cost methodology. AAR has developed replacement cost methodologies for locomotives and freight cars, described in detail below. In addition, the Board's SSAC procedures do not include a methodology for estimating the replacement cost of intermodal and automotive facilities. For the time being, I have used gross book value for their replacement cost However, since railroads are making substantial investments in these facilities and gross book value likely understates substantially the replacement cost of those facilities, it is particularly important to develop a methodology for estimating their current replacement cost. BNSF has developed a methodology to estimate replacement costs of intermodal and automotive facilities. The results of applying that methodology to BNSF's facilities are described briefly below.

1. Locomotives

In order to calculate locomotive replacement cost inputs, I determined, based primarily on data form R-1 annual reports, both the number of new locomotives each railroad would purchase and the per unit replacement cost. I performed two separate calculations for each railroad, one for higher horsepower locomotives used primarily to haul freight and one for lower horsepower locomotives that have multiple uses other than hauling freight or that may be used for switching. The total locomotive replacement cost is the sum of the higher power locomotive replacement cost and the lower power locomotive replacement cost.

For high-power locomotives, I determined the number of replacement units that would be required based on the assumption that fewer new locomotives are necessary to replace an existing fleet because newer locomotives tend to be more powerful than older locomotives. For each railroad, I calculated how much of the total aggregate horsepower capacity reported in the 2006 R-1 schedule 710 was attributable to owned locomotives by prorating reported aggregate horsepower capacity between owned and leased locomotives.[7] I then divided the resulting capacity figure by the horsepower rating of a new replacement locomotive, either 4000HP or 4400HP depending upon the railroad, to calculate the number of replacement units.[8] The locomotives were then subdivided into AC and DC powered based on the current mix of AC/DC power for each railroad

I used data contained in schedule 710S of the R-1 for the four railroads to calculate a 2005-2007 average replacement cost for a 4400HP DC locomotive, a 4400HP AC locomotive, and a 4000HP DC locomotive. These replacement costs were then multiplied by the appropriate unit numbers to determine a total freight locomotive replacement cost for each railroad

For lower power locomotives, I assumed that locomotives would be replaced on a one-for-one basis. I therefore determined the number of replacement units required by reference to

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[7] For BNSF, CSX, and NS, I used the aggregate capacity figure reported in the diesel-freight locomotive category. For UP, I used the capacity figure reported under the diesel-multiple purpose category as that is where UP reports the number and capacity of freight-haul locomotives it owns.

[8] I used 4400HP for all railroads except for NS. The NS R-1 data demonstrates that NS replaces older freight locomotives with 4000HP locomotives rather than 4400HP locomotives.

the number of multiple purpose and switch locomotives reported in the R-1 for each railroad.[9] I calculated a 2005-2007 average replacement cost for lower power locomotives based on data contained in schedule 710S of the R-1s for the four railroads and multiplied that cost by the appropriate number of locomotive units to determine a total replacement cost for lower power locomotives. Table 16 shows the replacement cost of purchased locomotives for each of the railroads

Table 16
Replacement Cost of Purchased Locomotives ($ millions)
2006

Railroad	Number of Locomotives	Replacement Cost
BNSF	2,963	$4,125.7
CSXT	2,891	$4,555.7
NS	3,268	$5,073.4
UP	4,188	$6,978.6

2. Freight Cars

I developed the replacement cost of freight cars for each of the railroads based on publicly available data. Freight car quantities were obtained from the R-1 annual reports and current replacement cost information was from the 2006 *Investor's Guide to Railroad Freight Cars and Locomotives*, published by RailSolutions, Inc. To develop freight car replacement costs for all car types except TOFC/COFC and multilevels, I began with the aggregate capacity for each of the car types as reported in Schedule 710 of the R-1. I then determined the relative proportion of that capacity attributable to freight cars owned by the railroads by multiplying the capacity by the ratio of owned cars to total cars. To determine the number of replacement freight cars, I divided the total owned capacity for each car type by the RailSolutions average capacity for each car type. Finally, I multiplied the replacement car counts for each car type by the

[9] For UP, I used only the number of units reported in the diesel-switching category as UP's high power locomotives are included in the multiple purpose category.

respective average cost per car from RailSolutions. The unit replacement cost for each R-1 line is based on the midpoint of the RailSolutions replacement cost range for cars of that type. If more than one RailSolutions replacement cost figure applies to cars on a particular line, a composite replacement cost was developed. Details of these calculations are set forth in my work papers.

TOFC/COFC and multilevel flat car replacement costs were developed by multiplying the number of owned units that appear in the R-1 Schedule 710 by the RailSolutions replacement cost for double stack intermodal cars and bi and tri-level autoracks respectively.

Table 17 shows the replacement cost for freight cars for each of the railroads.

Table 17
Replacement Cost of Freight Cars ($ millions)
2006

Railroad	Number of Freight Cars	Replacement Cost
BNSF	38,102	$2,841 8
CSXT	57,551	$4,261.0
NS	74,211	$5,422.1
UP	50,692	$3,789.7

3. Intermodal and Automotive Facilities

BNSF has developed a methodology for estimating the replacement cost of intermodal and automotive facilities which is described in the separate comments being filed by BNSF concurrently with the AAR petition and my verified statement. As those comments indicate, the estimated BNSF replacement cost of $2.72 billion for such facilities substantially exceeds the gross book value for account 25 of $854 million reported in BNSF's 2006 R-1.[10]

[10] If BNSF's estimated replacement cost is used as an input into the DCF instead of the gross book value that I used, BNSF's 2006 revenue requirement increases to $8,547.2 million from $8,377.2 million Similarly, BNSF's implicit ROI for 2006 decreases from 6.04% to 5.92%.

D. Asset Categories for Which There is No Specific SSAC Replacement Cost Proposal that Will Be Counted for Revenue Adequacy Purposes at Book Value

In addition to the asset accounts identified in Section C above, there are a number of asset accounts for which the Board has not developed a replacement cost methodology under SSAC, but represent a relatively small portion of current overall railroad investment. This group includes the following accounts:

- Account 7 – Elevated structures
- Account 18 – Water Stations
- Account 23 – Wharves and Docks
- Account 24 – Coal Wharves and Docks
- Account 29 – Power Plants
- Account 31 – Power Transmission Systems
- Account 35 – Miscellaneous Structures
- Account 37 – Roadway Machines
- Account 45 – Power Plant Machinery
- Account 54 – Passenger Train Cars
- Account 55 – Highway Revenue Equipment
- Account 56 – Floating Equipment
- Account 57 – Work Equipment
- Account 58 – Miscellaneous Equipment
- Account 59 – Computer Systems and WP Equipment

Overall, these accounts represent approximately 1.5 percent of overall railroad replacement cost based investment. For the calculation of the replacement cost revenue adequacy threshold, I have included investment for these accounts based on their gross book values.

E. Summary Table

The replacement costs I computed for BNSF, CSXT, NS and UP at 2006 levels are summarized in Table 18.

Table 18
Asset Replacement Costs

	Replacement Cost ($Millions)			
Asset	**BNSF**	**CSXT**	**NS**	**UP**
Roadbed Preparation	$14,112.6	$8,239.4	$8,511.8	$15,604.5
Tunnels	$1,104.0	$1,901.8	$1,220 8	$1,997 9
Bridges/Culverts	$6,619.1	$9,533.9	$7,885.3	$6,486.3
Track Excluding Ballast/Subballast	$23,747.0	$17,738.5	$18,423.3	$26,386.0
Ballast/Subballast	$4,207.7	$3,143.1	$3,264.4	$4,675.3
Signals and Communications	$4,128.0	$2,954.9	$2,961.0	$4,744.2
Buildings & Facilities	$190.2	$136.7	$131.8	$178.6
Public Improvements	$1,089.5	$613.1	$687.3	$978.0
Engineering	$6,071 8	$4,868.7	$4,739.4	$6,715.6
Mobilization and Contingencies	$7,644.9	$6,130.2	$5,967.4	$8,455.5
Land for Transportation Purposes	$1,694 2	$1,757.7	$1,971.2	$4,614.1
TOFC/COFC Facilities	$854.2	$102.7	$447 2	$615.5
Locomotives	$4,125.7	$4,555.7	$5,073.4	$6,978 6
Freight Cars	$2,841.8	$4,261.0	$5,422 1	$3,789.7
Elevated Structures			$40.8	
Water Stations	$5.8		$0.04	$3.9
Wharves and Docks	$13.7	$2.2	$0.03	$22.9
Coal Wharves and Docks	$12.3	$153 8	$168.3	$1.5
Power Plants	$2.9	$1.5	$2.8	
Power Transmission Systems	$33.8	$40.4	$28.4	$63.0
Miscellaneous Structures	$35.9		$15.0	$16.5
Roadway Machines	$395.9	$283.8	$349.9	$446.0
Power Plant Machinery	$3.4	$3.6	$15.4	
Passenger Train Cars		$0.7		
Highway Revenue Equipment	$15 2	$0.06	$154 2	$0 5
Floating Equipment		$1 1		
Work Equipment	$134.0	$101.7	$128.8	$128.3
Miscellaneous Equipment	$355.8	$238.5	$172.4	$8.9
Computer Systems and WP Equipment	$465.6	$4.1	$324.6	$369.8
Total Replacement Cost	$79,904.9	$66,769.0	$68,106.9	$93,281.2

Details supporting these calculations are set forth in Exhibits 2 through 5 to my statement and in my work papers.

III. SPECIFIC ADJUSTMENTS TO THE GENERAL DCF MODEL

Once the replacement cost inputs have been determined, the next step is to compute the annual revenues necessary in order for the railroads to earn revenues adequate at replacement cost levels. For this calculation, I have used the Board SSAC discounted cash flow (DCF) model, which computes an annual revenue requirement adequate to provide for return on investment, return of investment and Federal and state taxes. The DCF also provides for the future replacement of assets as they are projected to wear out at the end of their useful lives. In order to accommodate certain of the replacement cost elements described in Section III above, it was necessary to make certain modifications to the Board's SSAC DCF model. I explain those modifications and other inputs and assumption in the remainder of this section.

A. DCF Overview

The Board's SSAC DCF model uses an iterative approach to determine the pattern of capital recovery that would attract entry in a contestable marketplace The model solves for a starting revenue requirement that is then indexed for inflation over the SAC analysis period (in this case 20 years). Inflation indexes for the various components of the road-property investment (such as land, grading, rail) used in the analysis are derived from the Railroad Cost Indexes published quarterly by the AAR.

Because railroad assets typically have useful lives that extend beyond the DCF SAC analysis period, the DCF model does not recover the full investment in rail assets in the first 20 years. Instead the economic value of the assets at the end of the 20-year analysis period is estimated. This "terminal value" equals the capital recovery in the 20th year divided by the estimated real cost of capital. This calculation yields the value (at year 20) of a perpetual income stream held constant (in real terms) at the capital return projected for the 20th year.

The DCF model also provides for income taxes. The model includes a complex tax analysis that estimates the taxes, which are a function of interest on debt, depreciation of assets, and applicable state and federal taxes Because of various tax loss provisions, the DCF calculations assume the railroad will pay no taxes for the first few years.

The DCF model then calculates the present value of the projected capital recovery over the 20-year analysis period, together with the present value of the terminal value, minus the present value of taxes. If this total is less than the initial capital investment, plus interest, adjusted for depreciation and programmed maintenance, then the projected capital recovery would be too low to provide a reasonable return on investment. In that case, the initial capital recovery in the first year is adjusted upwards (or downwards if the flow of capital recovery is too low) and the steps described above are repeated. This iterative process continues until the model finds the point at which the flow of capital recovery would, after taxes, provide a reasonable return on the initial capital investment.

B. Inputs and Assumptions

Key inputs to the DCF model in addition to the amount of investment to be recovered include the cost of capital or discount rate, a forecast of inflation by asset group, an estimate of the useful lives by asset account and the average state income tax rate. Each of these are addressed individually.

<u>Cost of Capital</u> -- Because the DCF is being used to determine the amount of revenue required to provide for the return of, return on and taxes for the Board's revenue adequacy determinations, the discount rate used in the model for all years is set to the 2006 annual railroad

industry cost of capital determined by the Board. Table 19 below is from the April 15, 2008 Ex Parte No. 558 (Sub-No. 10) Railroad Cost of Capital – 2006 STB Decision at Table 15.

Table 19
2006 Cost of Capital Computation

Type of Capital	Cost	Weight	Weighted Average
Long-Term Debt	5.90%	23.05%	1.38%
Common Equity	11.13%	76.95%	8 56%
Composite Cost of Capital		**100.00%**	**9.94%**

Asset Inflation Index -- Assumptions relating to asset inflation in the DCF model are based on the AAR's Railroad Cost Indexes. Forecasts of future inflation are derived from Global Insights forecasts.

Asset Lives – Asset lives specific to each railroad are used in the DCF and are developed from the annual depreciation rates reported by each carrier in R-1 Schedule 332 and estimated salvage percentages.

Average State Income Tax Rate – The average state income tax rate was provided by each railroad for use in the DCF.

C. Modifications to the Board's DCF

In order to accommodate certain components of the replacement cost proposal, minor changes were made to the standard Board DCF model. These changes did not alter the overall functionality of the Board's DCF and relate primarily to enhancements to accommodate additional accounts and to compute results in a manner consistent with the Board's current revenue adequacy procedures

Removal of Operating Expenses and Netting Functions – In SSAC proceedings the DCF is used to compare over the multi-year DCF period the calculated stand-alone revenue requirement, which is comprised of both capital and operating expense components to stand-alone revenues. For revenue adequacy purposes, the DCF is being used to compare the annual capital requirement to each railroad's railway operating income adjusted as discussed below to exclude depreciation and tax expenses Because the operating income is net of operating expenses, there is no need to account for operating expenses in the DCF model, so the tab has been eliminated. Similarly, the function of the netting tab in the DCF model is to compare the stand-alone revenue requirement to stand-alone revenues over a multi-year period and "netting" the difference. Because the revenue adequacy test compares the first year's calculated revenue requirement to a railroad's modified adjusted operating income for that year, there is no need for the netting function.

Expansion to Accommodate Accounts Not Included in SSAC Capital Requirements – The DCF model provides essentially for the road property accounts identified in Table 2 above. Because the revenue adequacy test includes additional asset accounts, the DCF model was expanded to accommodate these additional accounts.

Calculations to Calculate Annual Return Percentage – The DCF model solves for an annual revenue requirement in dollars, while the Board's current revenue adequacy procedures calculate the rate of return earned by each carrier to be compared with the Board's annual cost of capital determination. To permit calculation of the rate of return being earned by a railroad, I supplemented the DCF model to include calculations of the annual rate of return (as a percentage) implicit in each carrier's operating income.

IV. COMPUTATION OF RAILROAD OPERATING INCOME FOR COMPARISON TO REVENUE REQUIREMENT

The Board's current revenue adequacy procedures compute a ratio of after-tax railway operating income to net investment. Because the SSAC DCF model provides for return of investment (depreciation) and Federal and state income taxes, the operating income to which the DCF revenue requirement is compared needs to be adjusted to make it comparable to the DCF results. This is accomplished by adding back to the net railroad operating income as calculated under the current revenue adequacy methodology the annual depreciation expense and all federal, state and deferred income taxes. Table 20 sets forth the revised operating income for each carrier.

Table 20
Adjustments to STB Revenue Adequacy NROI For Comparison to DCF Output

Item	BNSF	UP	NS	CSXT
Combined/Consolidated Net Railway Operating Income	$2,141,569	$1,818,974	$1,751,599	$1,108,133
+ Interest From Working Cap Cash	0	$0	$5,535	$0
-Inc Tax Non-rail	43,411	$26,177	$0	$20,653
-Net gain transfers	24,203	$44,389	$33,500	$14,345
Adjusted Net Railway Operating Income	**$2,209,183**	**$1,889,540**	**$1,790,634**	**$1,143,131**
Adjustments For Comparison to DCF Output Results:				
Add:				
Depreciation Expense	$1,165,422	$1,397,059	$790,165	$806,312
Federal Income Tax Expense	869,232	659,738	490,190	370,403
State Income Tax Expense	114,430	55,486	83,004	4,868
Allowance For Deferred Taxes	301,329	160,303	40,315	126,250
Subtotal Additions	$2,450,413	$2,272,586	$1,403,674	$1,307,833
Modified Net Operating Income	**$4,659,596**	**$4,162,126**	**$3,194,308**	**$2,450,964**

V. PRESENTATION OF RESULTS

Table 21 summarizes the revenue adequacy results

Table 21
Summary of Alternate Revenue Adequacy Results
2006

		Calculated Returns			
Methodology	2006 Industry Cost of Capital	BNSF	UP	NS	CSXT
STB DCF Expressed as a Revenue Requirement ($ millions):					
Revenue Requirement		$8,377 2	$9,720 7	$6,844 6	$6,720 1
Modified Net Operating Income		4,659.6	4,162 1	3,194 3	2,451 0
Shortfall		$3,717 6	$5,558 6	$3,650.3	$4,269 1
SSAC-Based Replacement Costs:					
STB DCF Expressed as a Return on Investment	9 94%	6 04%	4.83%	5 50%	4 36%

I declare under penalty of perjury that the foregoing is true and correct. I further certify that I am qualified and authorized to sponsor and file this testimony.

Executed on May 1, 2008

Michael R. Baranowski

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Michael R. Baranowski

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Education
B S in Accounting, Fairfield University

Supplemental Finance Studies, Kean College

Mike Baranowski provides financial and economic consulting services to the telecommunications and transportation industries He has special expertise in analyzing and developing complex computer costing models, operations analysis, and transportation engineering Much of his work involves providing oral and written expert testimony before courts and regulatory bodies

Some of Mr Baranowski's representative accomplishments include

- Overseeing the development of computer cost modeling tools designed to simulate the cost of competive entry into local telecommunications markets and directing the efforts of a nationwide team of testifying experts presenting the cost model results in multiple proceedings across the country
- Directing the analysis, critique and restatement of a variety of complex cost models developed by major telecommunications companies designed to simulate the forward-looking cost of competitive entry into local telecommunications markets
- Designing multiple PC-based spreadsheet models for use in calculating the stand-alone cost of competitive entry into the railroad and pipeline markets These models have been used to assist clients in all three network industries in making internal pricing decisions that are in compliance with governing regulatory standards
- Conducting detailed analyses of railroad operations and developing the associated capital requirements and operating expenses attributable to specific movements and the incremental capital and operating expense requirements attributable to major changes in anticipated traffic levels
- Calculating marginal and incremental costs for a major petroleum products pipeline company, an approach that is now used regularly by the company in making internal day-to-day pricing decisions

Mr Baranowski holds a B.S. in Accounting from Fairfield University in Fairfield, Connecticut and has pursued supplemental finance studies at Kean College in Union, New Jersey

TELECOMMUNICATIONS TESTIMONY

Federal Communications Commission

February 1998	File No E-98-05 AT&T Corp v Bell Atlantic Corp Affidavit of Michael R Baranowski
March 13, 1998	File No E-98-05 AT&T Corp v Bell Atlantic Corp Supplemental Affidavit of Michael R Baranowski
June 10, 1999	CC Docket No 96-98 Implementation of the Local Competition Provisions of the Telecommunications Act of 1996 Reply Affidavit of Michael R Baranowski, John C Klick and Brian F Pitkin

July 25, 2001	CC Docket No 00-251, 00-218 In the Matter of Petition of AT&T Communications of Virginia, Inc and WorldCom, Inc , Pursuant to Section 252(e)(5) of the Communications Act, for Preemption of the Jurisdiction of the Virginia State Corporation Commission Regarding Interconnection Disputes with Verizon-Virginia, Inc Panel
June 13, 2005	WC Docket No 05-25,RM-10593 In the Matter of Special Access Rates for Price Cap Local Exchange Carriers; AT&T Corp Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Joint Declaration on Behalf of SBC Communications, Inc
July 29, 2005	WC Docket No 05-25,RM-10593 In the Matter of Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Joint Reply Declaration on Behalf of SBC Communications, Inc

Public Service Commission of Delaware

February 4, 1997	PSC Docket No 96-324 In the Matter of Bell Atlantic - Delaware Statement of Terms and Conditions Under Section 252(F) of the Telecommunications Act of 1996 Testimony of Michael R Baranowski

Public Service Commission of the District of Columbia

March 24, 1997	Formal Case No 962 In the Matter of the Implementation of the District of Columbia Telecommunications Competition Act of 1996 Testimony of Michael R Baranowski
May 2, 1997	Formal Case No 962 In the Matter of the Implementation of the District of Columbia Telecommunications Competition Act of 1996 Rebuttal Testimony of Michael R Baranowski

Public Service Commission of the State of Maryland

March 7, 1997	Docket No 8731, Phase II In the Matter of the Petitions for Approval of Agreements and Arbitration of Unresolved Issues Arising Under Section 252 of the Telecommunications Act of 1996 Direct Testimony of Michael R Baranowski
April 4, 1997	Docket No 8731, Phase II In the Matter of the Petitions for Approval of Agreements and Arbitration of Unresolved Issues Arising Under Section 252 of the Telecommunications Act of 1996 Rebuttal Testimony of Michael R Baranowski
May 25, 2001	Case No 8879 In the Matter of the Investigation into Rates for Unbundled Network Elements Pursuant to the Telecommunications Act of 1996 Panel Testimony on Recurring Cost Issues

Public Service Commission of the State of Michigan

January 20, 2004 Case No U-13531 In the Matter, on the Commission's Own Motion to Review the Costs of Telecommunication Service Provided By SBC Michigan Initial Testimony of Michael R Baranowski and Julie A Murphy

May 10, 2004 Case No U-13531 In the Matter, on the Commission's Own Motion to Review the Costs of Telecommunication Service Provided By SBC Michigan Final Reply Testimony of Michael R Baranowski and Julie A Murphy

New Jersey Board of Public Utilities

December 20, 1996 Docket No TX 95120631 Notice of Investigation Local Exchange Competition for Telecommunications Services. Rebuttal Testimony of John C Klick and Michael R Baranowski

North Carolina Utilities Commission

March 9, 1998 Docket No P-100, Sub 133d In the Matter of Establishment of Universal Support Mechanisms Pursuant to Section 254 of the Telecommunications Act of 1996 Rebuttal Testimony of Michael R Baranowski

Pennsylvania Public Utility Commission

January 13, 1997 Docket Nos A-310203F0002 et al MFS-III Application of MFS Intelenet of Pennsylvania, Inc et Al (Phase III) Rebuttal Testimony of Michael R Baranowski

February 21, 1997 Docket Nos A-310203F0002 et al MFS-III Application of MFS Intelenet of Pennsylvania, Inc. et Al (Phase III) Surrebuttal Testimony of Michael R Baranowski

April 22, 1999 Docket Nos P-00991648, P-00991649 Petition of Senators and CLECs for Adoption of Partial Settlement and Joint Petition for Global Resolution of Telecommunications Proceedings Direct Testimony of Michael R Baranowski

January 11, 2002 Docket No R-00016683 Generic Investigation of Verizon Pennsylvania, Inc 's Unbundled Network Element Rates Panel Testimony on Recurring Cost Issues

State Corporation Commission Commonwealth of Virginia

April 7, 1997 Case No PUC970005 Ex Parte to Determine Prices Bell Atlantic - Virginia, Inc Is Authorized To Charge Competing Local Exchange Carriers In Accordance With The Telecommunications Act of 1996 And Applicable State Law Affidavit of Michael R Baranowski

April 23, 1997 Case No. PUC970005 Ex Parte to Determine Prices Bell Atlantic - Virginia, Inc Is Authorized To Charge Competing Local Exchange Carriers In Accordance With The Telecommunications Act of 1996 And Applicable State Law Direct Testimony of Michael R Baranowski

June 10, 1997	Case No PUC970005. Ex Parte to Determine Prices Bell Atlantic - Virginia, Inc Is Authorized To Charge Competing Local Exchange Carriers In Accordance With The Telecommunications Act of 1996 And Applicable State Law Rebuttal Testimony of Michael R Baranowski

Washington State Utilities and Transportation Commission

December 22, 2003	Docket No UT-033044 In the Matter of the Petition of Qwest Corporation To Initiate a Mass-Market Switching and Dedicated Transport Case Pursuant to the Triennial Review Order Direct Testimony of Michael R Baranowski
February 2, 2004	Docket No UT-033044 In the Matter of the Petition of Qwest Corporation To Initiate a Mass-Market Switching and Dedicated Transport Case Pursuant to the Triennial Review Order Response Testimony of Michael R Baranowski

Public Service Commission of West Virginia

February 13, 1997	Case Nos 96-1516-T-PC, 96-1561-T-PC, 96-1009-T-PC, 96-1533-T-T Petition to establish a proceeding to review the Statement of Generally Available Terms and Conditions offered by Bell Atlantic in accordance with Sections 251, 252, and 271 of the Telecommunications Act of 1996 Testimony of Michael R Baranowski
February 27, 1997	Case Nos 96-1516-T-PC, 96-1561-T-PC, 96-1009-T-PC, 96-1533-T-T Petition to establish a proceeding to review the Statement of Generally Available Terms and Conditions offered by Bell Atlantic in accordance with Sections 251, 252, and 271 of the Telecommunications Act of 1996 Rebuttal Testimony of Michael R Baranowski
June 3, 2002	Case No 01-1696-T-PC, Verizon West Virginia, Inc Petition For Declaratory Ruling That Pricing of Certain Additional Unbundled Network Elements (UNEs) Complies With Total Element Long-Run Incremental Cost (TELRIC) Principles Direct Testimony of Michael R Baranowski
July 1, 2002	Case No 01-1696-T-PC, Verizon West Virginia, Inc Petition For Declaratory Ruling That Pricing of Certain Additional Unbundled Network Elements (UNEs) Complies With Total Element Long-Run Incremental Cost (TELRIC) Principles Supplemental Direct Testimony of Michael R Baranowski

RAILROAD TESTIMONY

Interstate Commerce Commission

March 9, 1995	Finance Docket No. 32467 National Railroad Passenger Corporation and Consolidated Rail Corporation – Application Under Section 402(a) of the Rail Passenger Service Act for an Order Fixing Just Compensation
October 30, 1995	Docket No 41185 Arizona Public Service Company and Pacificorp v The Atchison, Topeka and Santa Fe Railway Company

Surface Transportation Board

July 11, 1997	Docket No 41989 Potomac Electric Power Company v CSX Transportation, Inc Reply Statement and Evidence of Defendant CSX Transportation, Inc
August 14, 2000	Docket No. 42051 Wisconsin Power and Light Company v Union Pacific Railroad Company, Reply Verified Statement of Christopher D Kent and Michael R Baranowski
September 20, 2002	STB Docket No 42070 Duke Energy Corporation v CSX Transportation, Inc , Reply Evidence and Argument of CSX Transportation, Inc.
September 30, 2002	STB Docket No 42069 Duke Energy Corporation v Norfolk Southern Railway Company, Reply Evidence and Argument of Norfolk Southern Railway Company
October 11, 2002	STB Docket No 42072 Carolina Power & Light v Norfolk Southern Railway Company, Reply Evidence and Argument of Norfolk Southern Railway Company
November 12, 2002	Docket No 42070 Duke Energy Corporation v CSX Transportation, Rebuttal Evidence and Argument of CSX Transportation
November 19, 2002	Docket No 42069 Duke Energy Corporation v Norfolk Southern Railway Company, Rebuttal Evidence and Argument of Norfolk Southern Railway Company
November 27, 2002	Docket No 42072 Carolina Power & Light Company v Norfolk Southern Railway Company, Rebuttal Evidence and Argument of Norfolk Southern Railway Company
January 10, 2003	STB Docket No 41185 Arizona Public Service Co And Pacificorp v The Atchison, Topeka and Santa Fe Railway Company, Petition of the Burlington Northern and Santa Fe Railway Company to Reopen and Vacate Rate Prescription
February 19, 2003	STB Docket No 42077, Arizona Public Service Co. And Pacificorp v The Burlington Northern and Santa Fe Railway Company, and STB Docket No 41185, Arizona Public Service Co And Pacificorp v The Burlington Northern and Santa Fe Railway Company, Reply of the Burlington Northern Santa Fe Railway Company in Opposition to Petition for Consolidation
April 4, 2003	Docket No 42057 Public Service Company of Colorado D/B/A Xcel Energy v The Burlington Northern and Santa Fe Railway Company, Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
October 8, 2003	Docket No 42071 Otter Tail Power Company v The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
October 24, 2003	Docket No 42069 Duke Energy Corporation v Norfolk Southern Railway Company, Supplemental Evidence of Norfolk Southern Railway Company

October 31, 2003	Docket No 42069 Duke Energy Corporation v Norfolk Southern Railway Company, Reply of Norfolk Southern Railway Company to Duke Energy Company's Supplemental Evidence
November 24, 2003	Docket No 42072 Carolina Power & Light Company v Norfolk Southern Railway Company, Supplemental Evidence of Norfolk Southern Railway Company
December 2, 2003	Docket No 42072 Carolina Power & Light Company v Norfolk Southern Railway Company, Reply of Norfolk Southern Railway Company to Carolina Power & Light Company's Supplemental Evidence
December 12, 2003	Docket No. 42069 Reply of Norfolk Southern Railway Company to Duke Energy Corporation's Petition to Correct Technical Error and Affidavit of Michael R Baranowski
January 5, 2004	Docket No 42070 Duke Energy Corporation v CSX Transportation, Inc, Supplemental Evidence of CSX Transportation, Inc
January 26, 2004	Docket No 42058 Arizona Electric Power Cooperative, Inc v The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company, Joint Supplemental Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company
March 22, 2004	Docket No 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Supplemental Reply Evidence of The Burlington Northern and Santa Fe Railway Company
April 9, 2004	Docket No 41185 Arizona Public Service Company and Pacificorp v The Burlington Northern and Santa Fe Railway Company, The Burlington Northern and Santa Fe Railway Company's Reply Evidence on Reopening
May 24, 2004	Docket No 41191 (Sub-No 1) AEP Texas North Company v The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
June 23, 2004	Docket No 42057 Public Service Company of Colorado d/b/a Xcel Energy v The Burlington Northern and Santa Fe Railway Company, Petition to Correct Technical and Computational Errors
March 1, 2005	Docket No 42071 Otter Tail Power Company v BNSF Railway Company, Supplemental Evidence of BNSF Railway Company
April 4, 2005	Docket No 42071 Otter Tail Power Company v BNSF Railway Company, Reply of BNSF Railway Company to Supplemental Evidence
July 20, 2005	Docket No 42088 Western Fuels Association, Inc and Basin Electric Power Cooperative, Inc v BNSF Railway Company, Reply Evidence of BNSF Railway Company

May 1, 2006	Docket No Ex Parte 657 (Sub-No 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Comments of BNSF Railway Company
May 31, 2006	Ex Parte 657 (Sub-No 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Reply Comments of BNSF Railway Company
June 15, 2006	Docket No 42088 Western Fuels Association, Inc and Basin Electric Power Cooperative, Inc v BNSF Railway Company, Reply Supplemental Evidence of BNSF Railway Company
June 15, 2006	Docket No 41191 (Sub 1) AEP Texas North Company v BNSF Railway Company, Reply Supplemental Evidence of BNSF Railway Company
June 30, 2006	Docket No Ex Parte 657 (Sub-No. 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Rebuttal Comments of BNSF Railway Company
February 4, 2008	Docket No 42099 E I DuPont De Nemours and Company v CSX Transportation, Inc , Opening Evidence of CSX Transportation, Inc
February 4, 2008	Docket No 42100 E I. DuPont De Nemours and Company v CSX Transportation, Inc , Opening Evidence of CSX Transportation, Inc
February 4, 2008	Docket No 42101 E I DuPont De Nemours and Company v CSX Transportation, Inc , Opening Evidence of CSX Transportation, Inc

US District Court for Northern District of Oklahoma

January 2, 2007	Case No 06-CV-33 TCK-SAJ, Grand River Dam Authority v BNSF Railway Company, Report of Michael R Baranowski
February 2, 2007	Case No 06-CV-33 TCK-SAJ, Grand River Dam Authority v BNSF Railway Company, Reply Report of Michael R Baranowski

Circuit Court of Pulaski County, Arkansas

August 17, 2007	Case No CV 2006-2711, Union Pacific Railroad v Entergy Arkansas, Inc and Entergy Services, Inc , Expert Witness Report of Michael R Baranowski
December 14, 2007	Case No CV 2006-2711, Union Pacific Railroad v Entergy Arkansas, Inc and Entergy Services, Inc , Reply Expert Witness Report of Michael R Baranowski

U S District Court for the Eastern District of Wisconsin

February 14, 2008	Case No 06-C-0515, Wisconsin Electric Power Company v Union Pacific Railroad Company, Expert Reply Report of Michael R Baranowski

Arbitrations and Mediations

March 7, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B Hunt Transport, Inc , Expert Report on behalf of BNSF Railway Company
March 28, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B Hunt Transport, Inc , Rebuttal Expert Report on behalf of BNSF Railway Company

April 12, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B Hunt Transport, Inc , Supplemental Expert Report on behalf of BNSF Railway Company
April 19, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B Hunt Transport, Inc , Supplemental Rebuttal Expert Report on behalf of BNSF Railway Company
April/May 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J B. Hunt Transport, Inc , Hearings before Arbitration Panel
February 20, 2007	In the Matter of the Arbitration between the Detroit Edison Company, et al, and BNSF Railway Company, Expert Report of Michael R Baranowski
March 19, 2007	In the Matter of the Arbitration between the Detroit Edison Company, et al, and BNSF Railway Company, Supplemental Expert Report of Michael R Baranowski

2

BNSF

SUMMARY OF ASSET REPLACEMENT COSTS

Asset Type	Replacement Costs	% of Investment
I. Road Property Investment Categories to Which SSAC Process Applied		
Roadbed Preparation	$14,112,574,835	17 7%
Tunnels	$1,104,016,500	1.4%
Bridges/Culverts	$6,619,078,338	8 3%
Track	$23,746,988,695	29 7%
Ballast and Subballast	$4,207,735,828	5 3%
Signals & Communication	$4,128,002,074	5 2%
Buildings & Facilities	$190,159,875	0 2%
Public Improvements	$1,089,496,038	1 4%
Engineering	$6,071,785,740	7 6%
Mobilization and Contingencies	$7,644,930,227	9 6%
Subtotal	$68,914,768,151	86 2%
II. Land		
Land	$1,694,163,000	2 1%
Subtotal	$1,694,163,000	2 1%
III. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and AAR Proposes Alternative Method		
TOFC/COFC terminals	$854,226,000	1 1%
Locomotives	$4,125,664,619	5 2%
Freight Cars	$2,841,786,000	3 6%
Subtotal	$7,821,676,619	9 8%
IV. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and Revenue Adequacy Based on Book Value		
Water Stations	$5,791,000	0 0%
Wharves and Docks	$13,712,000	0 0%
Coal and Ore Wharves	$12,252,000	0 0%
Power Plants	$2,877,000	0 0%
Power Transmission Systems	$33,805,000	0 0%
Miscellaneous Structures	$35,925,000	0 0%
Roadway Machines	$395,890,000	0 5%
Power Plant Machinery	$3,431,000	0 0%
Highway Revenue Equipment	$15,154,000	0 0%
Work Equipment	$134,017,000	0 2%
Miscellaneous Equipment	$355,843,000	0 4%
Computer Systems and WP Equipment	$465,555,000	0 6%
Subtotal	$1,474,252,000	1 8%
TOTAL	**$79,904,859,770**	**100.0%**

BNSF Roadbed Preparation

I. Summary

	Replacement Cost ($2006)
Cubic Yard Component	$12,380,241,363
Route Mile Component	$1,732,333,472
Total	**$14,112,574,835**

BNSF Roadbed Preparation

II. Cubic Yard Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-3
Comparison of Earthwork Unit Costs (per cubic yard)

								Indexed Values				
Case	**Year**	**Common**	**Loose**	**Solid**	**Borrow**	**Fine Grading**	**Index to 2006**	**Common**	**Loose**	**Solid**	**Borrow**	**Fine Grading**
Otter Tail	2002	$3 90	$6 57	$9 22	$12 35	$0 33	1 11367	$ 4 34	$ 7 32	$ 10 27	$ 13 75	$0 37
Duke/NS	2002	$3 32	$8 75	$9 09	$9 84	$0 00	1 17358	$ 3 90	$ 10 27	$ 10 67	$ 11.55	$0 00
Duke/CSXT	2002	$3 29	$8 67	$9 09	$9 81	$0 00	1 17358	$ 3 86	$ 10 17	$ 10 67	$ 11 51	$0 00
CP&L	2002	$3 34	$8 81	$9 20	$9 89	$0 00	1 17358	$ 3 92	$ 10 34	$ 10 80	$ 11 61	$0 00
XCEL	2001	$3 43	$8 00	$9 57	$12 26	$0 15 slope, $0 32 subgrade	1 16045	$ 3.98	$ 9 28	$ 11 11	$ 14 23	$0 17 slope, $0 37 subgrade
TMPA	2001	$3 19	$4 51	$7 15	$10 46	$0 00	1 16045	$ 3 70	$ 5 23	$ 8 30	$ 12 14	$0 00
Average								$ 3.95	$ 8 77	$ 10.30	$ 12.46	$0.17 slope, $0 37 subgrade

B. Cubic Yards 1/

BNSF Cubic Yards	
Common	615,456,351
Loose	65,126,892
Solid	98,122,968
Borrow	671,271,082
BNSF Total Cubic Yards	1,449,977,293
C. Cubic Yard Earthwork Costs (2006)	**$ 12,380,241,363**

1/ From workpaper file 'BNSF Earthwork Summary.xls'

BNSF Roadbed Preparation

III. Route Mile Component

A. Unit Cost

STB Ex Parte No 646 (Sub-No. 1)
Table A-4
Comparison of Other Earthwork Unit Costs

Case	Year	Total Cost ($ Millions)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost	Indexed Cost Per Route Mile
Otter Tail	2002	$43 8	1,208	$36,260	1 11367	$48 78	$40,380
Duke/NS	2002	$91 6	1,108	$82,643	1 17358	$107 50	$97,022
Duke/CSXT	2002	$93 8	1,197	$78,399	1 17358	$110 08	$91,965
CP&L	2002	$79 1	818	$96,555	1 17358	$92 83	$113,485
XCEL	2001	$21 7	367	$59,027	1 16045	$25 18	$68,615
TMPA	2001	$54 3	1,629	$33,303	1 16045	$63 01	$38,682
Average							$75,025

B. Route Miles 1/

BNSF Route Miles		23,090
Earthwork Cost per Route Mile (2006)	$	75,025
C. Route Mile Earthwork Costs (2006)	$	1,732,333,472
IV. Total Roadway Preparation	$	14,112,574,835

1/ From workpaper file 'BNSF Valuation WorkPapers.xls'

BNSF Tunnels

I. Summary

	Replacement Cost ($2006)
Tunnels	**$1,104,016,500**

II. Inventory and Calculation

Number of Single Track Tunnels 1/	86
Number of Multi Track Tunnels 1/	3
Single Track Linear Feet	172,241
Multi Track Linear Feet	6,721
Single Track Replacement Cost (per foot)	$6,000
Multi Track Replacement Cost (per foot)	$10,500
Single Track Tunnel Replacement Cost	**$1,033,446,000**
Multi Track Tunnel Replacement Cost	**$70,570,500**

1/ From workpaper file 'BNSF Valuation WorkPapers.xls'

BNSF Bridges

1. Summary

	Replacement Cost ($2006)
Bridges	$6,121,148,288
Culverts	$497,930,049
Total	**$6,619,078,338**

BNSF Bridges

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-7
Comparison of Western Bridge Construction Costs

Cases	Type 1 Cost per foot	Type 2 Cost per foot	Type 3 Cost per foot	Index to 2006	Indexed Costs Type 1 Cost per foot	Indexed Costs Type 2 Cost per foot	Indexed Costs Type 3 Cost per foot
Otter Tail	$2,315	$2,552	$4,300	1 11367	$2,578	$2,842	$4,789
Xcel	$1,793	$2,690	$4,427	1 16045	$2,081	$3,122	$5,137
TMPA	$2,225	$3,862	$4,409	1 16045	$2,582	$4,482	$5,116
Average Bridge Cost:					**$2,414**	**$3,482**	**$5,014**

Description of Bridge Types

Type 1	pre-stressed concrete girder bridges
Type 2	steel deck plate girder bridges
Type 3	steel through plate girder bridges

BNSF Bridges

III. BNSF Bridge Data Summary and Replacement Cost Calculation

Bridge Type	Span Count by Type 1/	Total Span Length by Type (Feet)	Total Replacement Costs by Type
Type 1	42,391	939,420	$2,268,134,489
Type 2	33,323	756,114	$2,635,146,809
Type 3	2,377	242,764	$1,217,866,991
Total	**78,091**	**1,938,297**	**$6,121,148,288**

1/ From workpaper files 'BNSF Bridges 1 xls' and 'BNSF Bridges 2.xls'

BNSF Culverts

I. Summary

	Replacement Cost ($2006)
Culverts	$497,930,049
Bridges	$6,121,148,288
Total	**$6,619,078,338**

BNSF Culverts

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-9
Comparison of Culvert Construction Costs (per LF)

Cases	CMP Culvert y = $/LF; x = sq in	RCB Culvert y = $/LF; x = sq ft	SSP Culvert y = $/LF; x = sq in	Index to 2006
Otter Tail	y = 0.0392x + 17.606	y = 4.017x + 172.3	y = 0.0171x +72.524	1.11367
Duke v. NS	y = 0.0277x + 8.89	y = 8.681x + 134.609	y = 0.0162x + 145.59	1.17358
Duke v. CSX	y = 0.0276x + 8.89	y = 8.671x + 134.295	y = 0.0161x + 145.66	1.17358
CPL v. NS	y = 0.025x + 11.322	y = 4.563x + 198.47	y = 0.0161x + 163.875	1.17358
Xcel	y = 0.0304x + 26.399	y = 3.886x + 286.052	y = 0.00934x + 155.158	1.16045
TMPA	y = 0.0237x + 14.695	y = 3.726x + 266.77	y = 0.0127x + 145.201	1.16045

Description of Types	
CMP	Corrugated Metal Pipe
RCB	Reinforced Concrete Box
SSP	Structural Steel Plate Pipe

BNSF Culverts

III. BNSF Culvert Data Summary and Replacement Cost Calculation

Culvert Type	Culvert Count 1/	Dollars	Avg Cost / Culvert
RCB	8,115	$237,754,789	$29,298
CMP	45,855	$226,660,445	$4,943
SSP	843	$24,042,422	$28,520
Undetermined	1,063	$9,472,393	$8,911
Total	**55,876**	**$497,930,049**	**$8,911**

1/ From workpaper files 'BNSF Culverts.xls'

BNSF Track Excluding Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Track excluding Ballast	**$ 23,746,988,695**

BNSF Track Excluding Ballast and Subballast

II. Unit Costs

Track Construction Costs
(w/ Ballast and Sub-Ballast costs removed)
From Table A-5: Comparison of Track Construction Costs

Case	Year	Total Cost ($Millions)	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$744 50	1,563	$476,342	1.20247	$895.24	$572,771
Duke/NS	2002	$693.90	1,382	$502,087	1.22324	$848.81	$614,188
Duke/CSXT	2002	$712.40	1,510	$471,816	1 22324	$871.44	$577,112
CP&L	2002	$508 30	1,073	$473,693	1 22324	$621.77	$579,473
XCEL	2001	$358 10	678	$528,123	1.22706	$439.41	$648,095
TMPA	2001	$1,271.20	2,403	$528,999	1 22706	$1,559.83	$649,119
Average							$606,793

III. Replacement Cost Calculation

BNSF Track Miles 1/	39,135
Cost per track mile (2006)	$606,793
BNSF Track Investement	$ 23,746,988,695

1/ From workpaper file 'BNSF Valuation WorkPapers xls'

BNSF Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Ballast and Sub Ballast	$ 3,230,116,660
Transportation Cost	$ 977,619,168
Total	**$ 4,207,735,828**

BNSF Ballast and Subballast

II. Material

A. Unit Cost

Ballast & Sub-Ballast Costs

Case	Year	Total Cost ($Millions) 1/	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$116.20	1,563	$74,344	1.20247	$139.73	$89,397
Duke/NS	2002	$84.70	1,382	$61,288	1.22324	$103.61	$74,970
Duke/CSXT	2002	$117.50	1,510	$77,815	1.22324	$143.73	$95,186
CP&L	2002	$62 20	1,073	$57,968	1.22324	$76.09	$70,909
XCEL	2001	$40.90	678	$60,324	1.22706	$50 19	$74,021
TMPA	2001	$177.70	2,403	$73,949	1.22706	$218 05	$90,740
Average							$82,537

B. Cost Calculation

BNSF Track Miles 2/	39,135
Cost per track mile (2006)	$82,537
BNSF Track Investment	$ 3,230,116,660

1/ Cost taken from Table A-5 of 2006 EP 646 compared to Table A-5 of 2007 EP 646 (Comparison of Track Construction Costs)
2/ From workpaper file 'BNSF Valuation WorkPapers.xls'

BNSF Ballast and Subballast

III. Transportation Cost

A. Unit Cost

Case	Year	Total Tons 1/	Track Miles	Tons per Track Mile
Otter Tail	2002	19,200,000	1,563	12,284
Duke/NS	2002	19,548,543	1,382	14,145
Duke/CSXT	2002	27,300,000	1,510	18,079
CP&L	2002	17,646,321	1,073	16,446
XCEL	2001	5,454,666	678	8,045
TMPA	2001	28,642,276	2,403	11,919
		117,791,806		**14,275**

B. Cost Calculation

BNSF Track Miles 2/		39,135
Tons Transported 3/		' 558,639,525
Average Length of Haul (miles) 4/		50
Rate of Transport (cost per mile) 5/	$	0.035
Cost of Tons Transported	**$**	**977,619,168**
IV. Total Ballast & Subballast Replacement Cost	**$**	**4,207,735,828**

1/ From individual cases
2/ From workpaper file 'BNSF Valuation WorkPapers xls'
3/ Weighted average tons per track mile multiplied by total system track miles
4/ Estimate based on the assumption that each railroad has ~ 20 quarries to receive ballast and subballast from, and that the railroad could use existing track to help transport the ballast and sub ballast to the track area that was being replaced
5/ Arizona Public Service Company vs. Atchison, Topeka and Santa Fe

BNSF Signals and Communications

I. Summary

	Replacement Cost ($2006)
Signals and Communications	**$ 4,128,002,074**

BNSF Signals and Communications

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-10
Comparison of Signalling & Communications Costs (with CTC)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$203,800	1,208	$168,669	1.11367	$187,842
Duke/NS	2002	$154,800	1,108	$139,689	1.17358	$163,937
Duke/CSXT	2002	$187,800	1,197	$156,914	1.17358	$184,152
CP&L	2002	$138,700	818	$169,578	1.17358	$199,014
XCEL	2001	$76,800	367	$209,142	1.16045	$242,700
TMPA	2001	$133,400	1,629	$81,883	1.16045	$95,022
Average						**$178,777**

III. Replacement Cost Calculation

BNSF Route Miles 1/		23,090
Cost of signals/communication per route mile	$	178,777
BNSF Investment in signals/communitation	$	4,128,002,074

1/ From workpaper file 'BNSF Valuation WorkPapers.xls'

BNSF Buildings and Facilities

I. Summary

	Replacement Cost ($2006)
Buildings and Facilities	**$190,159,875**

II. Cost Calculation

Used the tonnage coefficient associated with the highest tonnage Full-SAC case (Otter Tail)

m	b
slope	y intercept
0.09224545	43797489

m = tonnage coefficient
b = constant

Otter Tail Tons of Freight	219,600,000
Cost based on revised regression	$64,054,590
Cost per ton (based on Otter Tail)	$0 2917
BNSF Tons of Freight (Revenue - line 105) 1/	651,930,000
Replacement Cost	$190,159,875

1/ From R1 Annual Report - Schedule 755

BNSF Public Improvements

I. Summary

	Replacement Cost ($2006)
At Grade Crossings	$ 590,762,016
Separations	$ 498,734,022
Total	**$ 1,089,496,038**

BNSF Public Improvements

II. At Grade Crossings

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-12
Comparison of Public Improvement Costs
(w/out Grade Separations)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$29,500	1,208	$24,391	1 11367	$27,164
Duke/NS	2002	$17,300	1,108	$15,575	1 17358	$18,279
Duke/CSXT	2002	$3,700	1,197	$3,549	1 17358	$4,165
CP&L	2002	$7,600	818	$9,313	1 17358	$10,930
XCEL	2001	$12,300	367	$33,597	1 16045	$38,988
TMPA	2001	$75,800	1,629	$46,521	1 16045	$53,986
Average						$25,585

B. Replacement Cost Calculation

Public Improvement Costs (w/o Separations) per Route Mile	$25,585
BNSF Route Miles 1/	23,090
Public Improvements w/o Separations	$ 590,762,016

1/ From workpaper file 'BNSF Valuation WorkPapers xls'

BNSF Public Improvements

III. Grade Separations

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-13
Comparison of Grade Separation Costs

Case	Year	Total Cost ($000s)	Number of Separations	Cost per Separation	Index to 2006	Indexed Cost Per Separation
Otter Tail	2002	$9,600	17	$561,877	1.11367	$625,746
Duke/NS	2002	$16,900	8	$2,117,957	1.17358	$2,485,597
Duke/CSXT	2002	$3,700	7.9	$469,857	1.17358	$551,416
CP&L	2002	$3,300	6	$554,317	1.17358	$650,537
XCEL	2001	$8,800	16.3	$539,225	1.16045	$625,746
TMPA	2001	$23,300	28	$832,437	1.16045	$966,006
Total Separations (Including Duke/NS)			83.2			
Total Separations (excluding Duke/NS)			75.2			$746,608

B. Replacement Cost Calculation

BNSF Number of Grade Separated Crossings 1/	668
Cost of Separations 2/	$ 746,608
Grade Separated Public Improvements	$ 498,734,022

1/ From workpaper file 'BNSF Valuation WorkPapers.xls'

2/ *Rolling average cost for grade separations, weighted by number of separations*
(excluding Duke / NS)

BNSF Mobilization, Engineering and Contingencies

I. Mobilization

	$2006	Allocation by asset	Contingencies	Total Mobilization 1/
Road Preparation	$ 14,112,574,835	$ 493,940,119	$ 49,394,012	$ 543,334,131
Track	$ 23,746,988,695	$ 831,144,604	$ 83,114,460	$ 914,259,065
Ballast and Sub-ballast	$ 4,207,735,828	$ 147,270,754	$ 14,727,075	$ 161,997,829
Tunnels	$ 1,104,016,500	$ 38,640,578	$ 3,864,058	$ 42,504,635
Bridges and Culverts	$ 6,619,078,338	$ 231,667,742	$ 23,166,774	$ 254,834,516
Signals & Communications	$ 4,128,002,074	$ 144,480,073	$ 14,448,007	$ 158,928,080
Buildings & Facilities	$ 190,159,875	$ 6,655,596	$ 665,560	$ 7,321,155
Public Improvements	$ 1,089,496,038	$ 38,132,361	$ 3,813,236	$ 41,945,597
Total	$ 55,198,052,183			
Mobilization Factor	3.50%			
Total Mobilization	**$ 1,931,931,826**	**$ 1,931,931,826**	**$ 193,193,183**	**$ 2,125,125,009**

1/ Mobilization includes 3.5% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total mobilization costs for contingencies

BNSF Mobilization, Engineering and Contingencies

II. Engineering

	S2006	Allocation by asset	Contingencies	Total Engineering 1/
Road Preparation	$ 14,112,574,835	$ 1,411,257,484	$ 141,125,748	$ 1,552,383,232
Track	$ 23,746,988,695	$ 2,374,698,869	$ 237,469,887	$ 2,612,168,756
Ballast and Sub-ballast	$ 4,207,735,828	$ 420,773,583	$ 42,077,358	$ 462,850,941
Tunnels	$ 1,104,016,500	$ 110,401,650	$ 11,040,165	$ 121,441,815
Bridges and Culverts	$ 6,619,078,338	$ 661,907,834	$ 66,190,783	$ 728,098,617
Signals & Communications	$ 4,128,002,074	$ 412,800,207	$ 41,280,021	$ 454,080,228
Buildings & Facilities	$ 190,159,875	$ 19,015,988	$ 1,901,599	$ 20,917,586
Public Improvements	$ 1,089,496,038	$ 108,949,604	$ 10,894,960	$ 119,844,564
Total	$ 55,198,052,183			
Engineering Factor	10.00%			
Total Engineering	**$ 5,519,805,218**	**$ 5,519,805,218**	**$ 551,980,522**	**$ 6,071,785,740**

1/ Engineering includes 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total engineering costs for contingencies.

BNSF Mobilization, Engineering and Contingencies

III. Contingencies

	$2006	Total Contingencies 1/
Road Preparation	$ 14,112,574,835	$ 1,411,257,484
Track	$ 23,746,988,695	$ 2,374,698,869
Ballast and Sub-ballast	$ 4,207,735,828	$ 420,773,583
Tunnels	$ 1,104,016,500	$ 110,401,650
Bridges and Culverts	$ 6,619,078,338	$ 661,907,834
Signals & Communications	$ 4,128,002,074	$ 412,800,207
Buildings & Facilities	$ 190,159,875	$ 19,015,988
Public Improvements	$ 1,089,496,038	$ 108,949,604
Mobilization	$ 1,931,931,826	$ 193,193,183
Engineering	$ 5,519,805,218	$ 551,980,522
Total	$ 62,649,789,228	
Contingency Factor	10%	
Total Contingency	**$ 6,264,978,923**	**$ 6,264,978,923**
Mobilization,Engineering & Contingencies	**$ 13,716,715,968**	

1/ Contingencies include 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and mobilization and engineering costs

BNSF Mobilization, Engineering and Contingencies

IV. Allocation by Asset

Allocation of M,E&C		Mobil. & Conting	Engineering
Road Preparation	$ 3,506,974,847	$ 1,954,591,615	$ 1,552,383,232
Track	$ 5,901,126,691	$ 3,288,957,934	$ 2,612,168,756
Ballast and Sub-ballast	$ 1,045,622,353	$ 582,771,412	$ 462,850,941
Tunnels	$ 274,348,100	$ 152,906,285	$ 121,441,815
Bridges and Culverts	$ 1,644,840,967	$ 916,742,350	$ 728,098,617
Signals & Communications	$ 1,025,808,516	$ 571,728,287	$ 454,080,228
Buildings & Facilities	$ 47,254,729	$ 26,337,143	$ 20,917,586
Public Improvements	$ 270,739,765	$ 150,895,201	$ 119,844,564
Total M,E&C	**$ 13,716,715,968**	**$ 7,644,930,227**	**$ 6,071,785,740**

BNSF Replacement Cost of Locomotive Units Owned by Class and Traction Type
2006

Locomotive Units		Horsepower Capacity	Standard unit HP	Replacement Cost Units	Replacement Unit Cost	Replacement Cost
Diesel-freight - DC Traction		6,306 162	4400	1,433	$ 1,725,154	$ 2,472,522,226
Diesel-freight - AC Traction		2,186,986	4400	497	$ 1,820,256	$ 904,744,053
Diesel-multiple purpose		0	0	803	$ 724,490	$ 581,765,602
Diesel-switching		0	0	191	$ 724,490	$ 138,377,621
Auxiliary units				39	$ 724,490	$ 28,255,116
Total Locomotive Replacement Cost				2,963		$ 4,125,664,619

Replacement Cost Information Licensed to BNSF Railway by RailSolutions, Inc

Replacement Cost of BNSF Freight Cars
End of Year 2006

Car Type	BNSF owned	BNSF total	BNSF owned %	BNSF Total Capacity (tons)	BNSF owned capacity (tons)	Replacement Cars	Replacement Cost	Total
36-Plain box car - 40'	18	18	1 00	1,078	1,078	11	$ 83,000	$ 913,000
37 Plain box cars - 50' and longer	4	4	1 00	252	252	3	$ 83,000	$ 249,000
38-Equipped box cars	5,496	8,915	0 62	779,507	480 558	4,577	$ 83,000	$ 379,891,000
39-plain gondola cars	1 972	7 960	0 25	826,547	204,768	1,862	$ 64,000	$ 119,168,000
40-Equipped gondola cars	4,165	6,038	0 69	590,920	407,615	3,706	$ 70,000	$ 259,420,000
41-Covered hopper cars	16,181	33,488	0 48	3,502,056	1,692,151	15,384	$ 72,500	$ 1,115,340,000
42-Open top hopper cars - general	6,183	6,327	0 98	598,689	585,063	5,319	$ 75,000	$ 398,925,000
43-Open top hopper cars -special	1,151	4,950	0 23	510,353	118,670	1,079	$ 75,000	$ 80,925,000
44-Refrigerator cars - mechanical	798	1,684	0 47	143,807	68,146	650	$ 83,000	$ 53,950,000
45-Refrigerator cars - nonmechanical	2,947	2,947	1 00	232,316	232,316	2,213	$ 83,000	$ 183,679,000
46-Flat Cars - TOFC/COFC *	122	6,266	0 02	N/A	N/A	122	$ 175,000	$ 21,350,000
47-Flat cars - multilevel *	482	641	0 75	N/A	N/A	482	$ 62,000	$ 29,884,000
48-Flat cars - general service	142	142	1 00	10,292	10,292	94	$ 72,000	$ 6,768,000
49-Flat cars - other	2,611	4,974	0 52	459,585	241,250	2,194	$ 72,000	$ 157,968,000
50-Tank cars - under 22000 gal	120	120	1 00	9,256	9 256	93	$ 82,000	$ 7,626,000
51-Tank cars - 22000 gal and over	283	308	0 86	28,920	24,856	249	$ 82,000	$ 20,418,000
52-All other freight cars	92	92	1 00	6,620	6 620	64	$ 83,000	$ 5,312,000
Total Replacement Cost of Freight Cars	**42,747**	**84,872**		**7,700,198**		**38,102**		**$ 2,841,786,000**

* Replacement cars are based on R-1 car counts

AAR Car Code	Description	Capacity	2006 Avg Car Cost
A___ & B___	Boxcar, General Service	105	$ 83,000
C111, C112, C311, C312	Covered Hopper, Small Cu Cap	110	$ 63,000
C113, C114, C313, C314	Covered Hopper General Service	110	$ 67,000
C214	Covered Hopper, Special, Plastics/Resins	110	$ 80,000
C611, C612, C613, C614	Covered Hopper, Pressure Differential	110	$ 80,000
E___, G4__, G5__ G6__, G7__	Gondola, Mill and Coil Steel	110	$ 70,000
H___, K___	Open Hopper, Coal	110	$ 75 000
J301, J302, J303, J311, J312	Gondola, High Side, Coal	110	$ 64,000
F383, F483	Flatcar, Ctr Beam and Bulkhead	110	$ 72 000
S___	IM Container Car, Double Stack	3-car art	$ 175 000
T103 through T108	Tank Car, General Service	100	$ 80 000
T389 and >	Tank Car, High Pressure	100	$ 90 000
T054, T055	Tank Car, Acids	100	$ 76 000
V___	Autoracks	bi- or tri-	$ 62 000

3

CSXT

SUMMARY OF ASSET REPLACEMENT COSTS

Asset Type	Replacement Costs	% of Investment
I. Road Property Investment Categories to Which SSAC Process Applied		
Roadbed Preparation	$8,239,375,951	12 3%
Tunnels	$1,901,794,500	2 8%
Bridges/Culverts	$9,533,858,763	14 3%
Track	$17,738,481,731	26 6%
Ballast and Subballast	$3,143,086,733	4 7%
Signals & Communication	$2,954,934,580	4 4%
Buildings & Facilities	$136,683,918	0 2%
Public Improvements	$613,118,965	0 9%
Engineering	$4,868,746,865	7 3%
Mobilization and Contingencies	$6,130,194,917	9 2%
Subtotal	$55,260,276,923	82 8%
II. Land		
Land	$1,757,687,000	2 6%
Subtotal	$1,757,687,000	2 6%
III. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and AAR Proposes Alternative Method		
TOFC/COFC terminals	$102,713,000	0 2%
Locomotives	$4,555,727,527	6 8%
Freight Cars	$4,261,037,500	6 4%
Subtotal	$8,919,478,027	13 4%
IV. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and Revenue Adequacy Based on Book Value		
Wharves and Docks	$2,191,000	0 0%
Coal Wharves and Docks	$153,822,000	0 2%
Power Plants	$1,534,000	0 0%
Power Transmission Systems	$40,410,000	0 1%
Roadway Machines	$283,844,000	0 4%
Power Plant Machinery	$3,576,000	0 0%
Passenger Train Cars	$738,000	0 0%
Highway Revenue Equipment	$60,000	0 0%
Floating Equipment	$1,060,000	0 0%
Work Equipment	$101,721,000	0 2%
Miscellaneous Equipment	$238,507,000	0 4%
Computer Systems and WP Equipment	$4,081,000	0 0%
Subtotal	$831 544,000	1 2%
TOTAL	**$66,768,985,950**	**100.0%**

CSXT Roadbed Preparation

I. Summary

	Replacement Cost ($2006)
Cubic Yard Component	$6,999,325,198
Route Mile Component	$1,240,050,753
Total	**$8,239,375,951**

CSXT Roadbed Preparation

II. Cubic Yard Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-3
Comparison of Earthwork Unit Costs (per cubic yard)

Case	Year	Common	Loose	Solid	Borrow	Fine Grading	Indexed Values: Index to 2006	Common	Loose	Solid	Borrow	Fine Grading
Otter Tail	2002	$3 90	$6 57	$9 22	$12 35	$0 33	1 11367	$ 4.34	$ 7 32	$ 10 27	$ 13 75	$0 37
Duke/NS	2002	$3 32	$8 75	$9 09	$9 84	$0 00	1 17358	$ 3 90	$ 10 27	$ 10 67	$ 11 55	$0 00
Duke/CSXT	2002	$3 29	$8 67	$9 09	$9 81	$0 00	1 17358	$ 3 86	$ 10 17	$ 10 67	$ 11 51	$0 00
CP&L	2002	$3 34	$8 81	$9 20	$9 89	$0 00	1 17358	$ 3 92	$ 10 34	$ 10 80	$ 11.61	$0 00
XCEL	2001	$3 43	$8 00	$9 57	$12 26	$0 15 slope, $0 32 subgrade	1 16045	$ 3 98	$ 9 28	$ 11 11	$ 14 23	$0 17 slope, $0 37 subgrade
TMPA	2001	$3 19	$4 51	$7 15	$10 46	$0 00	1 16045	$ 3 70	$ 5 23	$ 8 30	$ 12 14	$0 00
Average								$ 3.95	$ 8.77	$ 10.30	$ 12.46	$0.17 slope, $0.37 subgrade

B. Cubic Yards 1/

CSXT Cubic Yards	
Common	722,847,301
Loose	83,324,734
Solid	227,218,570
Borrow	86,048,568
CSXT Total Cubic Yards	1,119,439,173
C. Cubic Yard Earthwork Costs (2006)	**$ 6,999,325,198**

1/ From workpaper file 'csxt roadbed prep xls'

CSXT Roadbed Preparation

III. Route Mile Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-4
Comparison of Other Earthwork Unit Costs

Case	Year	Total Cost ($ Millions)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost	Indexed Cost Per Route Mile
Otter Tail	2002	$43 8	1,208	$36,260	1 11367	$48 78	$40,380
Duke/NS	2002	$91 6	1,108	$82,643	1 17358	$107 50	$97,022
Duke/CSXT	2002	$93 8	1,197	$78,399	1 17358	$110 08	$91,965
CP&L	2002	$79 1	818	$96,555	1 17358	$92 83	$113,485
XCEL	2001	$21 7	367	$59,027	1 16045	$25 18	$68,615
TMPA	2001	$54 3	1,629	$33,303	1 16045	$63 01	$38,682
Average							$75,025

B. Route Miles 1/

CSXT Route Miles		16,529
Earthwork Cost per Route Mile (2006)	$	75,025
C. Route Mile Earthwork Costs (2006)	**$**	**1,240,050,753**
IV. Total Roadway Preparation	**$**	**8,239,375,951**

1/ From workpaper file 'CSXT Valuation WorkPapers xls'

CSXT Tunnels

I. Summary

	Replacement Cost ($2006)
Tunnels	**$1,901,794,500**

II. Inventory and Calculation

Number of Single Track Tunnels 1/	230
Number of Multi Track Tunnels 1/	48
Single Track Linear Feet	211,544
Multi Track Linear Feet	60,241
Single Track Replacement Cost (per foot)	$6,000
Multi Track Replacement Cost (per foot)	$10,500
Single Track Tunnel Replacement Cost	**$1,269,264,000**
Multi Track Tunnel Replacement Cost	**$632,530,500**

1/ From workpaper file 'CSXT Valuation WorkPapers.xls'

CSXT Bridges

I. Summary

	Replacement Cost ($2006)
Bridges	$9,359,668,709
Culverts	$174,190,054
Total	**$9,533,858,763**

CSXT Bridges

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-6
Comparison of Eastern Construction Costs

					Indexed Costs		
Cases	Type 1 Cost per foot	Type 2 Cost per foot	Type 3 Cost per foot	Index to 2006	Type 1 Cost per foot	Type 2 Cost per foot	Type 3 Cost per foot
Duke/NS	$6,044	$3,405	$3,813	1 17358	$7,093	$3,996	$4,475
Duke/CSXT	$4,892	$3,924	$3,993	1.17358	$5,741	$4,605	$4,686
CP&L	$5,790	$3,967	$3,701	1.17358	$6,795	$4,656	$4,343
Average Bridge Cost:					$6,543	$4,419	$4,501

Description of Bridge Types

Type 1	length from 10 - 40 feet
Type 2	length from 41 - 75 feet
Type 3	length greater than 75 feet

CSXT Bridges

III. CSXT Bridge Data Summary and Replacement Cost Calculation

Bridge Type	Span Count by Type 1/	Span Length by Type (Feet)	Replacement Costs by Type	Count of Bridges	% of Counts
Type 1	4,875	84,473	$552,715,354	4,059	38 5%
Type 2	4,936	121,931	$538,805,949	2,080	19 7%
Type 3	36,563	1,305,585	$5,877,053,826	4,414	41 8%
Total	46,374	1,511,989	$6,968,575,130	10,553	100.0%

Number of Bridges from Grade Separated Crossings (labeled as RR Under): 3,621

Bridge Type	Count of Bridges 1/	Replacement Cost by Bridge and by Type	Replacement Costs by Type
Type 1	1,393	136,170	$189,650,554
Type 2	714	259,041	$184,877,887
Type 3	1,515	1,331,458	$2,016,565,138
Total	3,621		$2,391,093,580

Total Cost of Bridges **$9,359,668,709**

1/ From workpaper files 'CSXT Bridges.xls'

CSXT Culverts

I. Summary

	Replacement Cost ($2006)
Culverts	$174,190,054
Bridges	$9,359,668,709
Total	**$9,533,858,763**

CSXT Culverts

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-9
Comparison of Culvert Construction Costs (per LF)

Cases	CMP Culvert y = $/LF; x = sq in	RCB Culvert y = $/LF; x = sq ft	SSP Culvert y = $/LF; x = sq in	Index to 2006
Otter Tail	y = 0.0392x + 17.606	y = 4.017x + 172.3	y = 0.0171x +72.524	1.11367
Duke v. NS	y = 0.0277x + 8.89	y = 8.681x + 134.609	y = 0.0162x + 145.59	1.17358
Duke v. CSX	y = 0.0276x + 8.89	y = 8.671x + 134.295	y = 0.0161x + 145.66	1.17358
CPL v. NS	y = 0.025x + 11.322	y = 4.563x + 198.47	y = 0.0161x + 163.875	1.17358
Xcel	y = 0.0304x + 26.399	y = 3.886x + 286.052	y = 0.00934x + 155.158	1.16045
TMPA	y = 0.0237x + 14.695	y = 3.726x + 266.77	y = 0.0127x + 145.201	1.16045

Description of Types	
CMP	Corrugated Metal Pipe
RCB	Reinforced Concrete Box
SSP	Structural Steel Plate Pipe

CSXT Culverts

III. CSXT Culvert Data Summary and Replacement Cost Calculation

Culvert Type	Culvert Count 1/	Dollars	Avg Cost / Culvert
RCB	7,515	$157,265,559	$20,927
CMP	11,454	$12,920,901	$1,128
SSP	292	$4,003,593	$13,711
Total	**19,261**	**$174,190,054**	**$9,044**

1/ From workpaper files 'CSXT Culverts.xls'

CSXT Track Excluding Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Track excluding Ballast	**$ 17,738,481,731**

CSXT Track Excluding Ballast and Subballast

II. Unit Costs

Track Construction Costs
(w/ Ballast and Sub-Ballast costs removed)
From Table A-5: Comparison of Track Construction Costs

Case	Year	Total Cost ($Millions)	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$744.50	1,563	$476,342	1.20247	$895.24	$572,771
Duke/NS	2002	$693.90	1,382	$502,087	1.22324	$848.81	$614,188
Duke/CSXT	2002	$712.40	1,510	$471,816	1.22324	$871.44	$577,112
CP&L	2002	$508.30	1,073	$473,693	1.22324	$621.77	$579,473
XCEL	2001	$358.10	678	$528,123	1.22706	$439.41	$648,095
TMPA	2001	$1,271.20	2,403	$528,999	1.22706	$1,559.83	$649,119
Average							$606,793

III. Replacement Cost Calculation

CSXT Track Miles 1/	29,233
Cost per track mile (2006)	$606,793
CSXT Track Investement	$ 17,738,481,731

1/ From workpaper file 'CSXT Valuation WorkPapers.xls'

CSXT Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Ballast and Sub Ballast	$ 2,412,826,574
Transportation Cost	$ 730,260,159
Total	**$ 3,143,086,733**

CSXT Ballast and Subballast

II. Material

A. Unit Cost

Ballast & Sub-Ballast Costs

Case	Year	Total Cost ($Millions) 1/	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$116 20	1,563	$74,344	1.20247	$139 73	$89,397
Duke/NS	2002	$84.70	1,382	$61,288	1.22324	$103 61	$74,970
Duke/CSXT	2002	$117.50	1,510	$77,815	1 22324	$143.73	$95,186
CP&L	2002	$62.20	1,073	$57,968	1.22324	$76 09	$70,909
XCEL	2001	$40.90	678	$60,324	1.22706	$50 19	$74,021
TMPA	2001	$177.70	2,403	$73,949	1.22706	$218.05	$90,740
Average							$82,537

B. Cost Calculation

CSXT Track Miles 2/	29,233
Cost per track mile (2006)	$82,537
CSXT Track Investment	$ 2,412,826,574

1/ Cost taken from Table A-5 of 2006 EP 646 compared to Table A-5 of 2007 EP 646 (Comparison of Track Construction Costs)
2/ From workpaper file 'CSXT Valuation WorkPapers.xls'

CSXT Ballast and Subballast

III. Transportation Cost

A. Unit Cost

Case	Year	Total Tons 1/	Track Miles	Tons per Track Mile
Otter Tail	2002	19,200,000	1,563	12,284
Duke/NS	2002	19,548,543	1,382	14,145
Duke/CSXT	2002	27,300,000	1,510	18,079
CP&L	2002	17,646,321	1,073	16,446
XCEL	2001	5,454,666	678	8,045
TMPA	2001	28,642,276	2,403	11,919
Total		117,791,806		14,275

B. Cost Calculation

CSXT Track Miles 2/		29,233
Tons Transported 3/		417,291,520
Average Length of Haul (miles) 4/		50
Rate of Transport (cost per mile) 5/	$	0.035
Cost of Tons Transported	$	730,260,159

IV. Total Ballast & Subballast Replacement Cost $ 3,143,086,733

1/ From individual cases
2/ From workpaper file 'CSXT Valuation WorkPapers.xls'
3/ Weighted average tons per track mile multiplied by total system track miles
4/ Estimate based on the assumption that each railroad has ~ 20 quarries to receive ballast and subballast from, and that the railroad could use existing track to help transport the ballast and sub ballast to the track area that was being replaced
5/ Arizona Public Service Company vs. Atchison, Topeka and Santa Fe

CSXT Signals and Communications

I. Summary

	Replacement Cost ($2006)
Signals and Communications	**$ 2,954,934,580**

CSXT Signals and Communications

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-10
Comparison of Signalling & Communications Costs (with CTC)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$203,800	1,208	$168,669	1.11367	$187,842
Duke/NS	2002	$154,800	1,108	$139,689	1.17358	$163,937
Duke/CSXT	2002	$187,800	1,197	$156,914	1.17358	$184,152
CP&L	2002	$138,700	818	$169,578	1.17358	$199,014
XCEL	2001	$76,800	367	$209,142	1.16045	$242,700
TMPA	2001	$133,400	1,629	$81,883	1.16045	$95,022
Average						**$178,777**

III. Replacement Cost Calculation

CSXT Route Miles 1/		16,529
Cost of signals/communication per route mile	$	178,777
CSXT Investment in signals/communitation	**$**	**2,954,934,580**

1/ From workpaper file 'CSXT Valuation WorkPapers.xls'

CSXT Buildings and Facilities

I. Summary

	Replacement Cost ($2006)
Buildings and Facilities	**$136,683,918**

II. Cost Calculation

Used the tonnage coefficient associated with the highest tonnage Full-SAC case (Otter Tail)

m	b
slope	y intercept
0 09224545	43797489

m = tonnage coefficient
b = constant

Otter Tail Tons of Freight	219,600,000
Cost based on revised regression	$64,054,590
Cost per ton (based on Otter Tail)	$0 2917
CSXT Tons of Freight (Revenue - line 105) 1/	468,597,000
Replacement Cost	$136,683,918

1/ From R1 Annual Report - Schedule 755

CSXT Public Improvements

I. Summary

	Replacement Cost ($2006)
At Grade Crossings	$ 422,883,293
Separations	$ 190,235,672
Total	**$ 613,118,965**

CSXT Public Improvements

II. At Grade Crossings

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-12
Comparison of Public Improvement Costs
(w/out Grade Separations)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$29,500	1,208	$24,391	1.11367	$27,164
Duke/NS	2002	$17,300	1,108	$15,575	1.17358	$18,279
Duke/CSXT	2002	$3,700	1,197	$3,549	1.17358	$4,165
CP&L	2002	$7,600	818	$9,313	1.17358	$10,930
XCEL	2001	$12,300	367	$33,597	1.16045	$38,988
TMPA	2001	$75,800	1,629	$46,521	1.16045	$53,986
Average						$25,585

B. Replacement Cost Calculation

Public Improvement Costs (w/o Separations) per Route Mile	$25,585
CSXT Route Miles 1/	16,529
Public Improvements w/o Separations	**$ 422,883,293**

1/ From workpaper file 'CSXT Valuation WorkPapers.xls'

CSXT Public Improvements

III. Grade Separations

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-13
Comparison of Grade Separation Costs

Case	Year	Total Cost ($000s)	Number of Separations	Cost per Separation	Index to 2006	Indexed Cost Per Separation
Otter Tail	2002	$9,600	17	$561,877	1.11367	$625,746
Duke/NS	2002	$16,900	8	$2,117,957	1.17358	$2,485,597
Duke/CSXT	2002	$3,700	7.9	$469,857	1.17358	$551,416
CP&L	2002	$3,300	6	$554,317	1.17358	$650,537
XCEL	2001	$8,800	16.3	$539,225	1.16045	$625,746
TMPA	2001	$23,300	28	$832,437	1.16045	$966,006
Total Separations (including Duke/NS)			83.2			
Total Separations (excluding Duke/NS)			75.2			$746,608

B. Replacement Cost Calculation

CSXT Number of Grade Separa ed Crossings 1/	255
Cost of Separations 2/	$ 746,608
Grade Separated Public Improvements	$ 190,235,672

1/ From workpaper file 'CSXT Valuation WorkPapers.xls'
2/ Rolling average cost for grade separations, weighted by number of separations (excluding Duke / NS)

CSXT Mobilization, Engineering and Contingencies

I. Mobilization

	$2006	Allocation by asset	Contingencies	Total Mobilization 1/
Road Preparation	$ 8,239,375,951	$ 288,378,158	$ 28,837,816	$ 317,215,974
Track	$ 17,738,481,731	$ 620,846,861	$ 62,084,686	$ 682,931,547
Ballast and Sub-ballast	$ 3,143,086,733	$ 110,008,036	$ 11,000,804	$ 121,008,839
Tunnels	$ 1,901,794,500	$ 66,562,808	$ 6,656,281	$ 73,219,088
Bridges and Culverts	$ 9,533,858,763	$ 333,685,057	$ 33,368,506	$ 367,053,562
Signals & Communications	$ 2,954,934,580	$ 103,422,710	$ 10,342,271	$ 113,764,981
Buildings & Facilities	$ 136,683,918	$ 4,783,937	$ 478,394	$ 5,262,331
Public Improvements	$ 613,118,965	$ 21,459,164	$ 2,145,916	$ 23,605,080
Total	$ 44,261,335,141			
Mobilization Factor	3.50%			
Total Mobilization	**$ 1,549,146,730**	**$ 1,549,146,730**	**$ 154,914,673**	**$ 1,704,061,403**

1/ Mobilization includes 3,5% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total mobilization costs for contingencies

CSXT Mobilization, Engineering and Contingencies

II. Engineering

	$2006	Allocation by asset	Contingencies	Total Engineering 1/
Road Preparation	$ 8,239,375,951	$ 823,937,595	$ 82,393,760	$ 906,331,355
Track	$ 17,738,481,731	$ 1,773,848,173	$ 177,384,817	$ 1,951,232,990
Ballast and Sub-ballast	$ 3,143,086,733	$ 314,308,673	$ 31,430,867	$ 345,739,541
Tunnels	$ 1,901,794,500	$ 190,179,450	$ 19,017,945	$ 209,197,395
Bridges and Culverts	$ 9,533,858,763	$ 953,385,876	$ 95,338,588	$ 1,048,724,464
Signals & Communications	$ 2,954,934,580	$ 295,493,458	$ 29,549,346	$ 325,042,804
Buildings & Facilities	$ 136,683,918	$ 13,668,392	$ 1,366,839	$ 15,035,231
Public Improvements	$ 613,118,965	$ 61,311,896	$ 6,131,190	$ 67,443,086
Total	$ 44,261,335,141			
Engineering Factor	10.00%			
Total Engineering	**$ 4,426,133,514**	**$ 4,426,133,514**	**$ 442,613,351**	**$ 4,868,746,865**

1/ Engineering includes 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total engineering costs for contingencies

CSXT Mobilization, Engineering and Contingencies

III. Contingencies

	$2006	Total Contingencies 1/
Road Preparation	$ 8,239,375,951	$ 823,937,595
Track	$ 17,738,481,731	$ 1,773,848,173
Ballast and Sub-ballast	$ 3,143,086,733	$ 314,308,673
Tunnels	$ 1,901,794,500	$ 190,179,450
Bridges and Culverts	$ 9,533,858,763	$ 953,385,876
Signals & Communications	$ 2,954,934,580	$ 295,493,458
Buildings & Facilities	$ 136,683,918	$ 13,668,392
Public Improvements	$ 613,118,965	$ 61,311,896
Mobilization	$ 1,549,146,730	$ 154,914,673
Engineering	$ 4,426,133,514	$ 442,613,351
Total	$ 50,236,615,385	
Contingency Factor	10%	
Total Contingency	**$ 5,023,661,538**	**$ 5,023,661,538**
Mobilization,Engineering & Contingencies	**$ 10,998,941,782**	

1/ Contingencies include 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and mobilization and engineering costs

CSXT Mobilization, Engineering and Contingencies

IV. Allocation by Asset

Allocation of M,E&C		Mobil & Conting.	Engineering
Road Preparation	$ 2,047,484,924	$ 1,141,153,569	$ 906,331,355
Track	$ 4,408,012,710	$ 2,456,779,720	$ 1,951,232,990
Ballast and Sub-ballast	$ 781,057,053	$ 435,317,513	$ 345,739,541
Tunnels	$ 472,595,933	$ 263,398,538	$ 209,197,395
Bridges and Culverts	$ 2,369,163,903	$ 1,320,439,439	$ 1,048,724,464
Signals & Communications	$ 734,301,243	$ 409,258,439	$ 325,042,804
Buildings & Facilities	$ 33,965,954	$ 18,930,723	$ 15,035,231
Public Improvements	$ 152,360,063	$ 84,916,977	$ 67,443,086
Total M,E&C	**$ 10,998,941,782**	**$ 6,130,194,917**	**$ 4,868,746,865**

CSXT Replacement Cost of Locomotive Units Owned by Class and Traction Type
2006

Locomotive Units		Horsepower Capacity	Standard unit HP	Replacement Cost Units	Replacement Unit Cost	Replacement Cost
Diesel-freight - DC Traction		6,706,501	4400	1,524	$ 1,725,154	$ 2,629,487,080
Diesel-freight - AC Traction		3,757,789	4400	854	$ 1,820,256	$ 1,554,576,992
Diesel-multiple purpose		0	0	0	$ -	$ -
Diesel-switching		0	0	324	$ 724,490	$ 234,734,813
Auxiliary units				189	$ 724,490	$ 136,928,641
Total Locomotive Replacement Cost				2,891		$ 4,555,727,527

Replacement Cost Information Licensed to BNSF Railway by RailSolutions, Inc

Replacement Cost of CSXT Freight Cars
End of Year 2006

Car Type	CSXT owned	CSXT total	CSXT owned %	CSXT Total Capacity (tons)	CSXT owned capacity (tons)	Replacement Cars	Replacement Cost	Total
36-Plain box car - 40'	-	-	0%	-	0	-	$ 83,000	$ -
37-Plain box cars - 50' and longer	11	11	100%	879	879	9	$ 83,000	$ 747,000
38-Equipped box cars	12 325	15,245	81%	1,227,157	992 110	9 449	$ 83,000	$ 784 267 000
39-plain gondola cars	4 897	7 655	64%	854,882	546,879	4 972	$ 64,000	$ 318,208,000
40-Equipped gondola cars	15,931	21 355	75%	2,146,141	1 601,038	14 555	$ 70,000	$ 1,018,850 000
41-Covered hopper cars	12 774	15 748	81%	1,589,905	1 289 652	11,725	$ 72,500	$ 850,062 500
42-Open top hopper cars - general	10 256	12 620	81%	1,301,343	1,057,573	9,615	$ 75,000	$ 721,125 000
43-Open top hopper cars -special	6 848	7,827	85%	808,442	686,664	6,243	$ 75,000	$ 468,225,000
44-Refrigerator cars mechanical	-	32	0%	2,817	0	-	$ 83,000	$ -
45-Refrigerator cars - nonmechanical	74	1,019	7%	74,529	5,412	52	$ 83,000	$ 4,316,000
46-Flat Cars - TOFC/COFC *	256	580	44%	N/A	N/A	256	$ 175,000	$ 44,800,000
47-Flat cars - multilevel *	-	12,548	0%	N/A	N/A	-	$ 62,000	$ -
48-Flat cars - general service	7	16	44%	1,216	532	5	$ 72,000	$ 360,000
49-Flat cars - other	595	6,686	9%	621,015	55,265	503	$ 72,000	$ 36,216,000
50-Tank cars - under 22000 gal	-	-	0%	-	0	-	$ 82,000	$ -
51-Tank cars - 22000 gal and over	-	35	0%	3,433	0	-	$ 82,000	$ -
52-All other freight cars	225	225	100%	17,450	17,450	167	$ 83,000	$ 13,861,000
Total Replacement Cost of Freight Cars	63,999	101,602		8,649,009		57,551		$ 4,261,037,500

* Replacement cars are based on R-1 car counts

AAR Car Code	Description	Capacity	2006 Avg Car Cost
A___ & B___	Boxcar, General Service	105	$ 83,000
C111, C112, C311, C312	Covered Hopper, Small Cu Cap	110	$ 63,000
C113, C114, C313, C314	Covered Hopper, General Service	110	$ 67,000
C214	Covered Hopper Special Plastics/Resins	110	$ 80,000
C611, C612, C613, C614	Covered Hopper, Pressure Differential	110	$ 80,000
E___, G4__, G5__, G6__, G7__	Gondola, Mill and Coil Steel	110	$ 70,000
H___, K___	Open Hopper, Coal	110	$ 75,000
J301 J302, J303, J311, J312	Gondola, High Side, Coal	110	$ 64,000
F383, F483	Flatcar, Ctr Beam and Bulkhead	110	$ 72 000
S___	IM Container Car, Double Stack	3-car art	$ 175,000
T103 through T108	Tank Car, General Service	100	$ 80,000
T389 and >	Tank Car, High Pressure	100	$ 90 000
T054, T055	Tank Car, Acids	100	$ 76 000
V___	Autoracks	bi- or tri-	$ 62,000

4

NS

SUMMARY OF ASSET REPLACEMENT COSTS

Asset Type	Replacement Costs	% of Investment
I. Road Property Investment Categories to Which SSAC Process Applied		
Roadbed Preparation	$8,511,776,550	12 5%
Tunnels	$1,220,817,000	1 8%
Bridges/Culverts	$7,885,267,127	11 6%
Track	$18,423,259,721	27 1%
Ballast and Subballast	$3,264,422,744	4 8%
Signals & Communication	$2,960,970,108	4 3%
Buildings & Facilities	$131,756,149	0 2%
Public Improvements	$687,299,602	1 0%
Engineering	$4,739,412,590	7 0%
Mobilization and Contingencies	$5,967,351,307	8 8%
Subtotal	$53,792,332,898	79 0%
II. Land		
Land	$1,971,203,000	2 9%
Subtotal	$1,971,203,000	2 9%
III. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and AAR Proposes Alternative Method		
TOFC/COFC terminals	$447,220,000	0 7%
Locomotives	$5,073,397,981	7 4%
Freight Cars	$5,422,129,500	8 0%
Subtotal	$10,942,747,481	16 1%
IV. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and Revenue Adequacy Based on Book Value		
Elevated Structures	$40,803,000	0 1%
Water Stations	$44,000	0 0%
Wharves and Docks	$27,000	0 0%
Coal Wharves and Docks	$168,302,000	0 2%
Power Plants	$2,787,000	0.0%
Power Transmission Systems	$28,399,000	0 0%
Miscellaneous Structures	$15,006,000	0 0%
Roadway Machines	$349,925,000	0 5%
Power Plant Machinery	$15,386,000	0 0%
Highway Revenue Equipment	$154,176,000	0 2%
Work Equipment	$128,785,000	0 2%
Miscellaneous Equipment	$172,411,000	0 3%
Computer Systems and WP Equipment	$324,597,000	0 5%
Subtotal	$1,400,648,000	2 1%
TOTAL	**$68,106,931,379**	**100.0%**

NS Roadbed Preparation

I. Summary

	Replacement Cost ($2006)
Cubic Yard Component	$7,269,192,962
Route Mile Component	$1,242,583,588
Total	**$8,511,776,550**

NS Roadbed Preparation

II. Cubic Yard Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-3
Comparison of Earthwork Unit Costs (per cubic yard)

Case	Year	Common	Loose	Solid	Borrow	Fine Grading	Indexed Values: Index to 2006	Indexed Values: Common	Indexed Values: Loose	Indexed Values: Solid	Indexed Values: Borrow	Indexed Values: Fine Grading
Otter Tail	2002	$3 90	$6 57	$9 22	$12 35	$0 33	1 11367	$ 4 34	$ 7 32	$ 10 27	$ 13 75	$0 37
Duke/NS	2002	$3 3	$8 75	$9 09	$9 84	$0 00	1 17358	$ 3 90	$ 10 27	$ 10 67	$ 11 55	$0 00
Duke/CSXT	2002	$3 29	$8 67	$9 09	$9 81	$0 00	1 17358	$ 3.86	$ 10 17	$ 10 67	$ 11 51	$0 00
CP&L	2002	$3 34	$8 81	$9 20	$9 89	$0 00	1 17358	$ 3 92	$ 10 34	$ 10 80	$ 11 61	$0 00
XCEL	2001	$3 43	$8 00	$9 57	$12 26	$0 15 slope, $0 32 subgrade	1 16045	$ 3.98	$ 9.28	$ 11.11	$ 14 23	$0 17 slope, $0 37 subgrade
TMPA	2001	$3 19	$4 51	$7 15	$10 46	$0 00	1 16045	$ 3.70	$ 5 23	$ 8 30	$ 12.14	$0 00
Average								$ 3.95	$ 8.77	$ 10.30	$ 12.46	$0.17 slope; $0.37 subgrade

B. Cubic Yards 1/

NS Cubic Yards	
Common	750,366,036
Loose	85,506,227
Solid	236,469,840
Borrow	89,797,799
NS Total Cubic Yards	1,162 139,903
C. Cubic Yard Earthwork Costs (2006)	$ 7,269,192,962

1/ From workpaper file 'NS earthwork quantities xls'

NS Roadbed Preparation

III. Route Mile Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-4
Comparison of Other Earthwork Unit Costs

Case	Year	Total Cost ($ Millions)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost	Indexed Cost Per Route Mile
Otter Tail	2002	$43 8	1,208	$36,260	1.11367	$48 78	$40,380
Duke/NS	2002	$91 6	1,108	$82,643	1 17358	$107 50	$97,022
Duke/CSXT	2002	$93 8	1,197	$78,399	1 17358	$110 08	$91,965
CP&L	2002	$79 1	818	$96,555	1 17358	$92 83	$113,485
XCEL	2001	$21 7	367	$59,027	1.16045	$25 18	$68,615
TMPA	2001	$54 3	1,629	$33,303	1.16045	$63 01	$38,682
Average							$75,025

B. Route Miles 1/

NS Route Miles		16,562
Earthwork Cost per Route Mile (2006)	$	75,025
C. Route Mile Earthwork Costs (2006)	**$**	**1,242,583,588**
IV Total Roadway Preparation	**$**	**8,511,776,550**

1/ From workpaper file 'NS Valuation WorkPapers xls'

NS Tunnels

I. Summary

	Replacement Cost ($2006)
Tunnels	**$1,220,817,000**

II. Inventory and Calculation

Number of Single Track Tunnels 1/	147
Number of Multi Track Tunnels 1/	24
Single Track Linear Feet	153,210
Multi Track Linear Feet	28,720
Single Track Replacement Cost (per foot)	$6,000
Multi Track Replacement Cost (per foot)	$10,500
Single Track Tunnel Replacement Cost	**$919,257,000**
Multi Track Tunnel Replacement Cost	**$301,560,000**

1/ From workpaper file 'NS Valuation WorkPapers.xls'

NS Bridges

I. Summary

	Replacement Cost ($2006)
Bridges	$7,360,208,532
Culverts	$525,058,595
Total	**$7,885,267,127**

NS Bridges

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-6
Comparison of Eastern Construction Costs

					Indexed Costs		
Cases	Type 1 Cost per foot	Type 2 Cost per foot	Type 3 Cost per foot	Index to 2006	Type 1 Cost per foot	Type 2 Cost per foot	Type 3 Cost per foot
Duke/NS	$6,044	$3,405	$3,813	1 17358	$7,093	$3,996	$4,475
Duke/CSXT	$4,892	$3,924	$3,993	1.17358	$5,741	$4,605	$4,686
CP&L	$5,790	$3,967	$3,701	1.17358	$6,795	$4,656	$4,343
Average Bridge Cost:					$6,543	$4,419	$4,501

Description of Bridge Types

Type 1	length from 10 - 40 feet
Type 2	length from 41 - 75 feet
Type 3	length greater than 75 feet

NS Bridges

III. NS Bridge Data Summary and Replacement Cost Calculation

Bridge Type	Span Count by Type 1/	Span Length by Type (Feet)	Replacement Costs by Type
Type 1	7,635	136,525	$893,298,731
Type 2	7,225	194,297	$858,583,791
Type 3	34,080	1,245,887	$5,608,326,011
Total	**48,940**	**1,576,709**	**$7,360,208,532**

1/ From workpaper files 'NS Bridges.xls'

NS Culverts

I. Summary

	Replacement Cost ($2006)
Culverts	$525,058,595
Bridges	$7,360,208,532
Total	**$7,885,267,127**

NS Culverts

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-9
Comparison of Culvert Construction Costs (per LF)

Cases	CMP Culvert y = $/LF; x = sq in	RCB Culvert y = $/LF; x = sq ft	SSP Culvert y = $/LF; x = sq in	Index to 2006
Otter Tail	y = 0.0392x + 17.606	y = 4.017x + 172.3	y = 0.0171x +72.524	1.11367
Duke v. NS	y = 0.0277x + 8.89	y = 8.681x + 134.609	y = 0.0162x + 145.59	1.17358
Duke v. CSX	y = 0.0276x + 8.89	y = 8.671x + 134.295	y = 0.0161x + 145.66	1.17358
CPL v. NS	y = 0.025x + 11.322	y = 4.563x + 198.47	y = 0.0161x + 163.875	1.17358
Xcel	y = 0.0304x + 26.399	y = 3.886x + 286.052	y = 0.00934x + 155.158	1.16045
TMPA	y = 0.0237x + 14.695	y = 3.726x + 266.77	y = 0.0127x + 145.201	1.16045

Description of Types	
CMP	Corrugated Metal Pipe
RCB	Reinforced Concrete Box
SSP	Structural Steel Plate Pipe

NS Culverts

III. NS Culvert Data Summary and Replacement Cost Calculation

Culvert Type	Culvert Count 1/	Dollars	Avg Cost / Culvert
RCB	5,117	$102,095,105	$19,952
CMP	49,528	$192,366,353	$3,884
SSP	13,330	$209,972,726	$15,752
Undetermined	2,780	$20,624,411	$7,419
Total	**70,755**	**$525,058,595**	**$7,421**

1/ From workpaper files 'NS Culverts.xls'

NS Track Excluding Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Track excluding Ballast	**$ 18,423,259,721**

NS Track Excluding Ballast and Subballast

II. Unit Costs

Track Construction Costs
(w/ Ballast and Sub-Ballast costs removed)
From Table A-5: Comparison of Track Construction Costs

Case	Year	Total Cost ($Millions)	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$744.50	1,563	$476,342	1.20247	$895.24	$572,771
Duke/NS	2002	$693 90	1,382	$502,087	1.22324	$848.81	$614,188
Duke/CSXT	2002	$712 40	1,510	$471,816	1.22324	$871.44	$577,112
CP&L	2002	$508 30	1,073	$473,693	1.22324	$621.77	$579,473
XCEL	2001	$358 10	678	$528,123	1.22706	$439.41	$648,095
TMPA	2001	$1,271.20	2,403	$528,999	1.22706	$1,559.83	$649,119
Average							**$606,793**

III. Replacement Cost Calculation

NS Track Miles 1/	30,362
Cost per track mile (2006)	$606,793
NS Track Investement	**$ 18,423,259,721**

1/ From workpaper file 'NS Valuation WorkPapers.xls'

NS Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Ballast and Sub Ballast	$ 2,505,971,554
Transportation Cost	$ 758,451,190
Total	**$ 3,264,422,744**

NS Ballast and Subballast

II. Material

A. Unit Cost

Ballast & Sub-Ballast Costs

Case	Year	Total Cost ($Millions) 1/	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$116 20	1,563	$74,344	1.20247	$139.73	$89,397
Duke/NS	2002	$84.70	1,382	$61,288	1.22324	$103.61	$74,970
Duke/CSXT	2002	$117 50	1,510	$77,815	1.22324	$143.73	$95,186
CP&L	2002	$62.20	1,073	$57,968	1 22324	$76.09	$70,909
XCEL	2001	$40.90	678	$60,324	1.22706	$50.19	$74,021
TMPA	2001	$177 70	2,403	$73,949	1.22706	$218.05	$90,740
Average							$82,537

B. Cost Calculation

NS Track Miles 2/	30,362
Cost per track mile (2006)	$82,537
NS Track Investment	$ 2,505,971,554

1/ Cost taken from Table A-5 of 2006 EP 646 compared to Table A-5 of 2007 EP 646 (Comparison of Track Construction Costs)
2/ From workpaper file 'NS Valuation WorkPapers.xls'

NS Ballast and Subballast

III. Transportation Cost

A. Unit Cost

Case	Year	Total Tons 1/	Track Miles	Tons per Track Mile
Otter Tail	2002	19,200,000	1,563	12,284
Duke/NS	2002	19,548,543	1,382	14,145
Duke/CSXT	2002	27,300,000	1,510	18,079
CP&L	2002	17,646,321	1,073	16,446
XCEL	2001	5,454,666	678	8,045
TMPA	2001	28,642,276	2,403	11,919
Total		**117,791,806**		**14,275**

B. Cost Calculation

NS Track Miles 2/		30,362
Tons Transported 3/		433,400,680
Average Length of Haul (miles) 4/		50
Rate of Transport (cost per mile) 5/	$	0.035
Cost of Tons Transported	**$**	**758,451,190**
IV. Total Ballast & Subballast Replacement Cost	**$**	**3,264,422,744**

1/ From individual cases
2/ From workpaper file 'NS Valuation WorkPapers.xls'
3/ Weighted average tons per track mile multiplied by total system track miles
4/ Estimate based on the assumption that each railroad has ~ 20 quarries to receive ballast and subballast from, and that the railroad could use existing track to help transport the ballast and sub ballast to the track area *that was being replaced*
5/ Arizona Public Service Company vs Atchison, Topeka and Santa Fe

NS Signals and Communications

I. Summary

	Replacement Cost ($2006)
Signals and Communications	**$ 2,960,970,108**

NS Signals and Communications

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-10
Comparison of Signalling & Communications Costs (with CTC)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$203,800	1,208	$168,669	1.11367	$187,842
Duke/NS	2002	$154,800	1,108	$139,689	1.17358	$163,937
Duke/CSXT	2002	$187,800	1,197	$156,914	1.17358	$184,152
CP&L	2002	$138,700	818	$169,578	1.17358	$199,014
XCEL	2001	$76,800	367	$209,142	1.16045	$242,700
TMPA	2001	$133,400	1,629	$81,883	1.16045	$95,022
Average						**$178,777**

III. Replacement Cost Calculation

NS Route Miles 1/		16,562
Cost of signals/communication per route mile	$	178,777
NS Investment in signals/communitation	**$**	**2,960,970,108**

1/ From workpaper file 'NS Valuation WorkPapers.xls'

NS Buildings and Facilities

I. Summary

	Replacement Cost ($2006)
Buildings and Facilities	**$131,756,149**

II. Cost Calculation

Used the tonnage coefficient associated with the highest tonnage Full-SAC case (Otter Tail)

m	b
slope	y intercept
0 09224545	43797489

m = tonnage coefficient
b = constant

Otter Tail Tons of Freight	219,600,000
Cost based on revised regression	$64,054,590
Cost per ton (based on Otter Tail)	$0 2917
NS Tons of Freight (Revenue - line 105) 1/	451,703,000
Replacement Cost	**$131,756,149**

1/ From R1 Annual Report - Schedule 755

NS Public Improvements

I. Summary

	Replacement Cost ($2006)
At Grade Crossings	$ 423,747,043
Separations	$ 263,552,559
Total	**$ 687,299,602**

NS Public Improvements

II. At Grade Crossings

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-12
Comparison of Public Improvement Costs
(w/out Grade Separations)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$29,500	1,208	$24,391	1.11367	$27,164
Duke/NS	2002	$17,300	1,108	$15,575	1.17358	$18,279
Duke/CSXT	2002	$3,700	1,197	$3,549	1.17358	$4,165
CP&L	2002	$7,600	818	$9,313	1.17358	$10,930
XCEL	2001	$12,300	367	$33,597	1.16045	$38,988
TMPA	2001	$75,800	1,629	$46,521	1.16045	$53,986
Average						$25,585

B. Replacement Cost Calculation

Public Improvement Costs (w/o Separations) per Route Mile	$25,585
NS Route Miles 1/	16,562
Public Improvements w/o Separations	$ 423,747,043

1/ From workpaper file 'NS Valuation WorkPapers.xls'

NS Public Improvements

III. Grade Separations

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-13
Comparison of Grade Separation Costs

Case	Year	Total Cost ($000s)	Number of Separations	Cost per Separation	Index to 2006	Indexed Cost Per Separation
Otter Tail	2002	$9,600	17	$561,877	1.11367	$625,746
Duke/NS	2002	$16,900	8	$2,117,957	1.17358	$2,485,597
Duke/CSXT	2002	$3,700	7.9	$469,857	1.17358	$551,416
CP&L	2002	$3,300	6	$554,317	1.17358	$650,537
XCEL	2001	$8,800	16.3	$539,225	1.16045	$625,746
TMPA	2001	$23,300	28	$832,437	1.16045	$966,006
Total Separations (including Duke/NS)			83.2			
Total Separations (excluding Duke/NS)			75.2			$746,608

B. Replacement Cost Calculation

NS Number of Grade Separated Crossings 1/	353
Cost of Separations 2/	$ 746,608
Grade Separated Public Improvements	$ 263,552,559

1/ From workpaper file 'NS Valuation WorkPapers.xls'
2/ Rolling average cost for grade separations, weighted by number of separations (excluding Duke / NS)

NS Mobilization, Engineering and Contingencies

I. Mobilization

	$2006	Allocation by asset	Contingencies	Total Mobilization 1/
Road Preparation	$ 8,511,776,550	$ 297,912,179	$ 29,791,218	$ 327,703,397
Track	$ 18,423,259,721	$ 644,814,090	$ 64,481,409	$ 709,295,499
Ballast and Sub-ballast	$ 3,264,422,744	$ 114,254,796	$ 11,425,480	$ 125,680,276
Tunnels	$ 1,220,817,000	$ 42,728,595	$ 4,272,860	$ 47,001,455
Bridges and Culverts	$ 7,885,267,127	$ 275,984,349	$ 27,598,435	$ 303,582,784
Signals & Communications	$ 2,960,970,108	$ 103,633,954	$ 10,363,395	$ 113,997,349
Buildings & Facilities	$ 131,756,149	$ 4,611,465	$ 461,147	$ 5,072,612
Public Improvements	$ 687,299,602	$ 24,055,486	$ 2,405,549	$ 26,461,035
Total	$ 43,085,569,001			
Mobilization Factor	3.50%			
Total Mobilization	**$ 1,507,994,915**	**$ 1,507,994,915**	**$ 150,799,492**	**$ 1,658,794,407**

1/ Mobilization includes 3,5% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total mobilization costs for contingencies

NS Mobilization, Engineering and Contingencies

II. Engineering

	$2006	Allocation by asset	Contingencies	Total Engineering 1/
Road Preparation	$ 8,511,776,550	$ 851,177,655	$ 85,117,766	$ 936,295,421
Track	$ 18,423,259,721	$ 1,842,325,972	$ 184,232,597	$ 2,026,558,569
Ballast and Sub-ballast	$ 3,264,422,744	$ 326,442,274	$ 32,644,227	$ 359,086,502
Tunnels	$ 1,220,817,000	$ 122,081,700	$ 12,208,170	$ 134,289,870
Bridges and Culverts	$ 7,885,267,127	$ 788,526,713	$ 78,852,671	$ 867,379,384
Signals & Communications	$ 2,960,970,108	$ 296,097,011	$ 29,609,701	$ 325,706,712
Buildings & Facilities	$ 131,756,149	$ 13,175,615	$ 1,317,561	$ 14,493,176
Public Improvements	$ 687,299,602	$ 68,729,960	$ 6,872,996	$ 75,602,956
Total	$ 43,085,569,001			
Engineering Factor	10 00%			
Total Engineering	**$ 4,308,556,900**	**$ 4,308,556,900**	**$ 430,855,690**	**$ 4,739,412,590**

1/ Engineering includes 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total engineering costs for contingencies

NS Mobilization, Engineering and Contingencies

III. Contingencies

	$2006	Total Contingencies 1/
Road Preparation	$ 8,511,776,550	$ 851,177,655
Track	$ 18,423,259,721	$ 1,842,325,972
Ballast and Sub-ballast	$ 3,264,422,744	$ 326,442,274
Tunnels	$ 1,220,817,000	$ 122,081,700
Bridges and Culverts	$ 7,885,267,127	$ 788,526,713
Signals & Communications	$ 2,960,970,108	$ 296,097,011
Buildings & Facilities	$ 131,756,149	$ 13,175,615
Public Improvements	$ 687,299,602	$ 68,729,960
Mobilization	$ 1,507,994,915	$ 150,799,492
Engineering	$ 4,308,556,900	$ 430,855,690
Total	$ 48,902,120,816	
Contingency Factor	10%	
Total Contingency	**$ 4,890,212,082**	**$ 4,890,212,082**
Mobilization, Engineering & Contingencies	**$ 10,706,763,897**	

1/ Contingencies include 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and mobilization and engineering costs

NS Mobilization, Engineering and Contingencies

IV. Allocation by Asset

Allocation of M,E&C		Mobil & Conting.	Engineering
Road Preparation	$ 2,115,176,473	$ 1,178,881,052	$ 936,295,421
Track	$ 4,578,180,041	$ 2,551,621,471	$ 2,026,558,569
Ballast and Sub-ballast	$ 811,209,052	$ 452,122,550	$ 359,086,502
Tunnels	$ 303,373,025	$ 169,083,155	$ 134,289,870
Bridges and Culverts	$ 1,959,488,881	$ 1,092,109,497	$ 867,379,384
Signals & Communications	$ 735,801,072	$ 410,094,360	$ 325,706,712
Buildings & Facilities	$ 32,741,403	$ 18,248,227	$ 14,493,176
Public Improvements	$ 170,793,951	$ 95,190,995	$ 75,602,956
Total M,E&C	**$ 10,706,763,897**	**$ 5,967,351,307**	**$ 4,739,412,590**

NS Replacement Cost of Locomotive Units Owned by Class and Traction Type
2006

Locomotive Units		Horsepower Capacity	Standard unit HP	Replacement Cost Units	Replacement Unit Cost	Replacement Cost
Diesel-freight - DC Traction		11,969,023	4000	2,992	$ 1,628,684	$ 4,873,438,696
Diesel-freight - AC Traction		0	0	0	$ -	$ -
Diesel-multiple purpose		0	0	0	$ -	$ -
Diesel-switching		0	0	202	$ 724,490	$ 146,347,013
Auxiliary units				74	$ 724,490	$ 53,612,272
Total Locomotive Replacement Cost				3,268		$ 5,073,397,981

Replacement Cost Information Licensed to BNSF Railway by RailSolutions, Inc

Replacement Cost of NS Freight Cars
End of Year 2006

Car Type	NS owned	NS total	NS owned %	NS Total Capacity (tons)	NS owned capacity (tons)	Replacement Cars	Replacement Cost	Total
36-Plain box car - 40'	-	-	0%	-	0	-	$ 83,000	$ -
37-Plain box cars 50' and longer	49	510	10%	52,324	5 027	48	$ 83,000	$ 3,984,000
38-Equipped box cars	17,354	19 118	91%	1,518,785	1,378 648	13,130	$ 83,000	$ 1,089,790,000
39-plain gondola cars	17,325	19,531	89%	2,201,173	1 952 553	17,751	$ 64,000	$ 1 136 064,000
40-Equipped gondola cars	12,481	18,560	67%	1,888,870	1,270,204	11,548	$ 70,000	$ 808,360,000
41-Covered hopper cars	9,036	12,049	75%	1,319,234	989,343	8,995	$ 72,500	$ 652,137,500
42-Open top hopper cars - general	15,122	15 930	95%	1,693,730	1,607 821	14,617	$ 75,000	$ 1,096,275,000
43-Open top hopper cars -special	3,717	3,717	100%	392,271	392,271	3,567	$ 75,000	$ 267 525,000
44 Refrigerator cars - mechanical	-	-	0%	-	0	-	$ 83,000	$ -
45-Refrigerator cars - nonmechanical	147	266	55%	19,625	10,845	104	$ 83,000	$ 8,632,000
46-Flat Cars - TOFC/COFC *	235	957	25%	N/A	N/A	235	$ 175,000	$ 41,125 000
47-Flat cars - multilevel *	627	1,141	55%	N/A	N/A	627	$ 62,000	$ 38,874 000
48-Flat cars general service	137	137	100%	10,498	10,498	96	$ 72,000	$ 6,912,000
49-Flat cars - other	1 709	1,809	94%	184,823	174,806	1,588	$ 72,000	$ 114,336,000
50-Tank cars - under 22000 gal		-	0%	-	0		$ 82,000	$ -
51-Tank cars - 22000 gal and over	4	24	0%	2,367	0	-	$ 82,000	$ -
52-All other freight cars	4,024	4,024	100%	200,003	200 003	1,905	$ 83,000	$ 158,115,000
Total Replacement Cost of Freight Cars	**81,967**	**97,773**		**9,483,703**		**74,211**		**$ 5,422,129,500**

* Replacement cars are based on R-1 car counts

AAR Car Code	Description	Capacity	2006 Avg Car Cost
A__ & B__	Boxcar, General Service	105	$ 83,000
C111, C112, C311, C312	Covered Hopper, Small Cu Cap	110	$ 83,000
C113, C114, C313, C314	Covered Hopper, General Service	110	$ 67,000
C214	Covered Hopper, Special, Plastics/Resins	110	$ 80,000
C611, C612, C613, C614	Covered Hopper, Pressure Differential	110	$ 80,000
E__, G4__, G5__, G6__, G7__	Gondola, Mill and Coil Steel	110	$ 70,000
H__, K__	Open Hopper, Coal	110	$ 75,000
J301, J302, J303, J311 J312	Gondola, High Side, Coal	110	$ 64,000
F383, F483	Flatcar, Ctr Beam and Bulkhead	110	$ 72,000
S__	IM Container Car Double Stack	3-car art	$ 175,000
T103 through T108	Tank Car, General Service	100	$ 80,000
T389 and >	Tank Car, High Pressure	100	$ 90,000
T054, T055	Tank Car, Acids	100	$ 76,000
V__	Autoracks	bi- or tri-	$ 62,000

5

UP

SUMMARY OF ASSET REPLACEMENT COSTS

Asset Type	Replacement Costs	% of Investment
I. Road Property Investment Categories to Which SSAC Process Applied		
Roadbed Preparation	$15,604,502,673	16 7%
Tunnels	$1,997,923,500	2 1%
Bridges/Culverts	$6,486,274,176	7 0%
Track	$26,385,973,143	28 3%
Ballast and Subballast	$4,675,338,250	5 0%
Signals & Communication	$4,744,215,389	5 1%
Buildings & Facilities	$178,593,296	0 2%
Public Improvements	$978,039,939	1 0%
Engineering	$6,715,594,640	7 2%
Mobilization and Contingencies	$8,455,544,161	9 1%
Subtotal	$76,221,999,166	81 7%
II. Land		
Land	$4,614,065,000	4 9%
Subtotal	$4,614,065,000	4 9%
III. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and AAR Proposes Alternative Method		
TOFC/COFC terminals	$615,487,000	0 7%
Locomotives	$6,978,578,386	7 5%
Freight Cars	$3,789,727,500	4 1%
Subtotal	$11,383,792,886	12 2%
IV. Property Accounts For Which No Explicit EP 646 Replacement Method Exists and Revenue Adequacy Based on Book Value		
Water Stations	$3,907,000	0 0%
Wharves and Docks	$22,867,000	0 0%
Coal Wharves and Docks	$1,533,000	0 0%
Power Transmission Systems	$62,993,000	0 1%
Miscellaneous Structures	$16,499,000	0 0%
Roadway Machines	$446,049,000	0 5%
Highway Revenue Equipment	$539,000	0 0%
Work Equipment	$128,284,000	0 1%
Miscellaneous Equipment	$8,900,000	0 0%
Computer Systems and WP Equipment	$369,795,000	0.4%
Subtotal	$1,061,366,000	1.1%
TOTAL	**$93,281,223,052**	**100 0%**

UP Roadbed Preparation

I. Summary

	Replacement Cost ($2006)
Cubic Yard Component	$13,613,572,686
Route Mile Component	$1,990,929,987
Total	**$15,604,502,673**

UP Roadbed Preparation

II. Cubic Yard Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-3
Comparison of Earthwork Unit Costs (per cubic yard)

								Indexed Values				
Case	Year	Common	Loose	Solid	Borrow	Fine Grading	Index to 2006	Common	Loose	Solid	Borrow	Fine Grading
Otter Tail	2002	$3 90	$6 57	$9 22	$12 35	$0 33	1 11367	$ 4 34	$ 7 32	$ 10 27	$ 13 75	$0 37
Duke/NS	2002	$3 32	$8 75	$9 09	$9 84	$0 00	1 17358	$ 3 90	$ 10 27	$ 10 67	$ 11 55	$0 00
Duke/CSXT	2002	$3 29	$8 67	$9 09	$9 81	$0 00	1 17358	$ 3 86	$ 10 17	$ 10 67	$ 11 51	$0 00
CP&L	2002	$3 34	$8 81	$9 20	$9 89	$0 00	1 17358	$ 3 92	$ 10 34	$ 10 80	$ 11 61	$0 00
XCEL	2001	$3 43	$8 00	$9 57	$12 26	$0 15 slope $0 32 subgrade	1 16045	$ 3 98	$ 9 28	$ 11 11	$ 14 23	$0 17 slope, $0 37 subgrade
TMPA	2001	$3 19	$4 51	$7 15	$10 46	$0 00	1 16045	$ 3 70	$ 5 23	$ 8 30	$ 12 14	$0 00
Average								$ 3.95	$ 8.77	$ 10.30	$ 12.46	$0.17 slope; $0.37 subgrade

B. Cubic Yards 1/

UP Cubic Yards	
Common	674 079,858
Loose	70 392,662
Solid	107,269,345
Borrow	*740,375,418*
UP Total Cubic Yards	1,592,117,283
C. Cubic Yard Earthwork Costs (2006)	**$ 13,613,572,686**

1/ From workpaper file 'UP Earthwork Summary xls'

UP Roadbed Preparation

III. Route Mile Component

A. Unit Cost

STB Ex Parte No. 646 (Sub-No. 1)
Table A-4
Comparison of Other Earthwork Unit Costs

Case	Year	Total Cost ($ Millions)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost	Indexed Cost Per Route Mile
Otter Tail	2002	$43 8	1 208	$36,260	1 11367	$48 78	$40,380
Duke/NS	2002	$91 6	1 108	$82,643	1 17358	$107 50	$97,022
Duke/CSXT	2002	$93 8	1,197	$78,399	1 17358	$110 08	$91,965
CP&L	2002	$79 1	818	$96,555	1 17358	$92 83	$113,485
XCEL	2001	$21 7	367	$59,027	1 16045	$25 18	$68,615
TMPA	2001	$54 3	1,629	$33,303	1 16045	$63 01	$38,682
Average							$75,025

B. Route Miles 1/

UP Route Miles		26,537
Earthwork Cost per Route Mile (2006)	$	75,025
C. Route Mile Earthwork Costs (2006)	**$**	**1,990,929,987**
IV. Total Roadway Preparation	**$**	**15,604,502,673**

1/ From workpaper file 'UP Valuation WorkPapers xls'

UP Tunnels

I. Summary

	Replacement Cost ($2006)
Tunnels	**$1,997,923,500**

II. Inventory and Calculation

Number of Single Track Tunnels 1/	293
Number of Multi Track Tunnels 1/	8
Single Track Linear Feet	321,089
Multi Track Linear Feet	6,799
Single Track Replacement Cost (per foot)	$6,000
Multi Track Replacement Cost (per foot)	$10,500
Single Track Tunnel Replacement Cost	**$1,926,534,000**
Multi Track Tunnel Replacement Cost	**$71,389,500**

1/ From workpaper file 'UP Valuation WorkPapers.xls'

UP Bridges

I. Summary

	Replacement Cost ($2006)
Bridges	$6,165,557,872
Culverts	$320,716,304
Total	**$6,486,274,176**

UP Bridges

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-7
Comparison of Western Bridge Construction Costs

Cases	Type 1 Cost per foot	Type 2 Cost per foot	Type 3 Cost per foo	Index to 2006	Indexed Costs Type 1 Cost per foot	Indexed Costs Type 2 Cost per foot	Indexed Costs Type 3 Cost per foot
Otter Tail	$2,315	$2,552	$4,300	1 11367	$2,578	$2,842	$4,789
Xcel	$1,793	$2,690	$4,427	1 16045	$2,081	$3,122	$5,137
TMPA	$2,225	$3,862	$4,409	1 16045	$2,582	$4,482	$5,116
Average Bridge Cost:					$2,414	$3,482	$5,014

Description of Bridge Types	
Type 1	pre-stressed concrete girder bridges
Type 2	steel deck plate girder bridges
Type 3	steel through plate girder bridges

UP Bridges

III. UP Bridge Data Summary and Replacement Cost Calculation

Bridge Type	Span Count by Type 1/	Total Span Length by Type (Feet)	Total Replacement Costs by Type
Type 1	63,699	1,165,768	$2,813,718,438
Type 2	14,924	550,576	$1,916,991,638
Type 3	3,010	286,158	$1,434,847,796
Total	**81,633**	**2,002,501**	**$6,165,557,872**

1/ From workpaper files 'UP Bridges xls'

UP Culverts

I. Summary

	Replacement Cost ($2006)
Culverts	$320,716,304
Bridges	$6,165,557,872
Total	**$6,486,274,176**

UP Culverts

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-9
Comparison of Culvert Construction Costs (per LF)

Cases	CMP Culvert y = $/LF; x = sq in	RCB Culvert y = $/LF; x = sq ft	SSP Culvert y = $/LF; x = sq in	Index to 2006
Otter Tail	$y = 0.0392x + 17.606$	$y = 4.017x + 172.3$	$y = 0.0171x + 72.524$	1.11367
Duke v. NS	$y = 0.0277x + 8.89$	$y = 8.681x + 134.609$	$y = 0.0162x + 145.59$	1.17358
Duke v. CSX	$y = 0.0276x + 8.89$	$y = 8.671x + 134.295$	$y = 0.0161x + 145.66$	1.17358
CPL v. NS	$y = 0.025x + 11.322$	$y = 4.563x + 198.47$	$y = 0.0161x + 163.875$	1.17358
Xcel	$y = 0.0304x + 26.399$	$y = 3.886x + 286.052$	$y = 0.00934x + 155.158$	1.16045
TMPA	$y = 0.0237x + 14.695$	$y = 3.726x + 266.77$	$y = 0.0127x + 145.201$	1.16045

Description of Types	
CMP	Corrugated Metal Pipe
RCB	Reinforced Concrete Box
SSP	Structural Steel Plate Pipe

UP Culverts

III. UP Culvert Data Summary and Replacement Cost Calculation

Culvert Type	Culvert Count 1/	Dollars	Avg Cost / Culvert
RCB	14,852	$237,774,268	$16,010
CMP	41,935	$44,305,813	$1,057
SSP	2,756	$38,636,222	$14,019
Total	**59,543**	**$320,716,304**	**$5,386**

1/ From workpaper files 'UP Culverts.xls'

UP Track Excluding Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Track excluding Ballast	**$ 26,385,973,143**

UP Track Excluding Ballast and Subballast

II. Unit Costs

Track Construction Costs
(w/ Ballast and Sub-Ballast costs removed)
From Table A-5: Comparison of Track Construction Costs

Case	Year	Total Cost ($Millions)	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$744.50	1,563	$476,342	1 20247	$895.24	$572,771
Duke/NS	2002	$693.90	1,382	$502,087	1.22324	$848.81	$614,188
Duke/CSXT	2002	$712.40	1,510	$471,816	1.22324	$871.44	$577,112
CP&L	2002	$508.30	1,073	$473,693	1.22324	$621.77	$579,473
XCEL	2001	$358.10	678	$528,123	1.22706	$439.41	$648,095
TMPA	2001	$1,271 20	2,403	$528,999	1.22706	$1,559 83	$649,119
Average							$606,793

III. Replacement Cost Calculation

UP Track Miles 1/	43,484
Cost per track mile (2006)	$606,793
UP Track Investement	$ 26,385,973,143

1/ From workpaper file 'UP Valuation WorkPapers xls'

UP Ballast and Subballast

I. Summary

	Replacement Cost ($2006)
Ballast and Sub Ballast	$ 3,589,077,021
Transportation Cost	$ 1,086,261,228
Total	**$ 4,675,338,250**

UP Ballast and Subballast

II. Material

A. Unit Cost

Ballast & Sub-Ballast Costs

Case	Year	Total Cost ($Millions) 1/	Track Miles	Cost per Track Mile	Index to 2006	Indexed Cost	Cost per Track Mile
Otter Tail	2002	$116.20	1,563	$74,344	1 20247	$139 73	$89,397
Duke/NS	2002	$84.70	1,382	$61,288	1.22324	$103.61	$74,970
Duke/CSXT	2002	$117.50	1,510	$77,815	1 22324	$143 73	$95,186
CP&L	2002	$62.20	1,073	$57,968	1 22324	$76.09	$70,909
XCEL	2001	$40 90	678	$60,324	1.22706	$50.19	$74,021
TMPA	2001	$177.70	2,403	$73,949	1 22706	$218.05	$90,740
Average							$82,537

B. Cost Calculation

UP Track Miles 2/	43,484
Cost per track mile (2006)	$82,537
UP Track Investment	$ 3,589,077,021

1/ Cost taken from Table A-5 of 2006 EP 646 compared to Table A-5 of 2007 EP 646 (Comparison of Track Construction Costs)
2/ From workpaper file 'UP Valuation WorkPapers.xls'

UP Ballast and Subballast

III. Transportation Cost

A. Unit Cost

Case	Year	Total Tons 1/	Track Miles	Tons per Track Mile
Otter Tail	2002	19,200,000	1,563	12,284
Duke/NS	2002	19,548,543	1,382	14,145
Duke/CSXT	2002	27,300,000	1,510	18,079
CP&L	2002	17,646,321	1,073	16,446
XCEL	2001	5,454,666	678	8,045
TMPA	2001	28,642,276	2,403	11,919
		117,791,806		14,275

B. Cost Calculation

UP Track Miles 2/		43,484
Tons Transported 3/		620,720,702
Average Length of Haul (miles) 4/		50
Rate of Transport (cost per mile) 5/	$	0.035
Cost of Tons Transported	$	1,086,261,228
IV. Total Ballast & Subballast Replacement Cost	$	4,675,338,250

1/ From individual cases
2/ From workpaper file 'UP Valuation WorkPapers.xls'
3/ Weighted average tons per track mile multiplied by total system track miles
4/ Estimate based on the assumption that each railroad has ~ 20 quarries to receive ballast and subballast from, and that the railroad could use existing track to help transport the ballast and sub ballast to the track area that was being replaced
5/ Arizona Public Service Company vs. Atchison, Topeka and Santa Fe

UP Signals and Communications

I. Summary

	Replacement Cost ($2006)
Signals and Communications	**$ 4,744,215,389**

UP Signals and Communications

II. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-10
Comparison of Signalling & Communications Costs (with CTC)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$203,800	1,208	$168,669	1.11367	$187,842
Duke/NS	2002	$154,800	1,108	$139,689	1.17358	$163,937
Duke/CSXT	2002	$187,800	1,197	$156,914	1.17358	$184,152
CP&L	2002	$138,700	818	$169,578	1.17358	$199,014
XCEL	2001	$76,800	367	$209,142	1.16045	$242,700
TMPA	2001	$133,400	1,629	$81,883	1.16045	$95,022
Average						$178,777

III. Replacement Cost Calculation

UP Route Miles 1/		26,537
Cost of signals/communication per route mile	$	178,777
UP Investment in signals/communitation	$	4,744,215,389

1/ From workpaper file 'UP Valuation WorkPapers.xls'

UP Buildings and Facilities

I. Summary

	Replacement Cost ($2006)
Buildings and Facilities	**$178,593,296**

II. Cost Calculation

Used the tonnage coefficient associated with the highest tonnage Full-SAC case (Otter Tail)

m	b
slope	y intercept
0 09224545	43797489

m = tonnage coefficient
b = constant

Otter Tail Tons of Freight	219,600,000
Cost based on revised regression	$64,054,590
Cost per ton (based on Otter Tail)	$0 2917
UP Tons of Freight (Revenue - line 105) 1/	612,276,000
Replacement Cost	**$178,593,296**

1/ From R1 Annual Report - Schedule 755

UP Public Improvements

I. Summary

	Replacement Cost ($2006)
At Grade Crossings	$ 678,948,847
Separations	$ 299,091,091
Total	**$ 978,039,939**

UP Public Improvements

II. At Grade Crossings

A. Unit Costs

STB Ex Parte No. 646 (Sub-No. 1)
Table A-12
Comparison of Public Improvement Costs
(w/out Grade Separations)

Case	Year	Total Cost ($000s)	Route Miles	Cost per Route Mile	Index to 2006	Indexed Cost per Route Mile
Otter Tail	2002	$29,500	1,208	$24,391	1 11367	$27,164
Duke/NS	2002	$17,300	1,108	$15,575	1 17358	$18,279
Duke/CSXT	2002	$3,700	1,197	$3,549	1 17358	$4,165
CP&L	2002	$7,600	818	$9,313	1 17358	$10,930
XCEL	2001	$12,300	367	$33,597	1 16045	$38,988
TMPA	2001	$75,800	1,629	$46,521	1 16045	$53,986
Average						$25,585

B. Replacement Cost Calculation

Public Improvement Costs (w/o Separations) per Route Mile	$25,585
UP Route Miles 1/	26,537
Public Improvements w/o Separations	$ 678,948,847

1/ From workpaper file 'UP Valuation WorkPapers xls'

UP Public Improvements

III. Grade Separations

A. Unit Costs

**STB Ex Parte No. 646 (Sub-No. 1)
Table A-13
Comparison of Grade Separation Costs**

Case	Year	Total Cost ($000s)	Number of Separations	Cost per Separation	Index to 2006	Indexed Cost Per Separation
Otter Tail	2002	$9,600	17	$561,877	1 11367	$625,746
Duke/NS	2002	$16,900	8	$2,117,957	1.17358	$2,485,597
Duke/CSXT	2002	$3,700	7 9	$469,857	1 17358	$551,416
CP&L	2002	$3,300	6	$554,317	1 17358	$650,537
XCEL	2001	$8,800	16 3	$539,225	1 16045	$625,746
TMPA	2001	$23,300	28	$832,437	1 16045	$966,006
Total Separations (including Duke/NS)			83.2			
Total Separations (excluding Duke/NS)			75.2			$746,608

B. Replacement Cost Calculation

UP Number of Grade Separated Crossings 1/	401
Cost of Separations 2/	$ 746,608
Grade Separated Public Improvements	$ 299,091,091

1/ From workpaper file 'UP Valuation WorkPapers xls'

2/ Rolling average cost for grade separations, weighted by number of separations (excluding Duke / NS)

UP Mobilization, Engineering and Contingencies

I. Mobilization

	$2006	Allocation by asset	Contingencies	Total Mobilization 1/
Road Preparation	$ 15,604,502,673	$ 546,157,594	$ 54,615,759	$ 600,773,353
Track	$ 26,385,973,143	$ 923,509,060	$ 92,350,906	$ 1,015,859,966
Ballast and Sub-ballast	$ 4,675,338,250	$ 163,636,839	$ 16,363,684	$ 180,000,523
Tunnels	$ 1,997,923,500	$ 69,927,323	$ 6,992,732	$ 76,920,055
Bridges and Culverts	$ 6,486,274,176	$ 227,019,596	$ 22,701,960	$ 249,721,556
Signals & Communications	$ 4,744,215,389	$ 166,047,539	$ 16,604,754	$ 182,652,292
Buildings & Facilities	$ 178,593,296	$ 6,250,765	$ 625,077	$ 6,875,842
Public Improvements	$ 978,039,939	$ 34,231,398	$ 3,423,140	$ 37,654,538
Total	$ 61,050,860,365			
Mobilization Factor	3.50%			
Total Mobilization	**$ 2,136,780,113**	**$ 2,136,780,113**	**$ 213,678,011**	**$ 2,350,458,124**

1/ Mobilization includes 3 5% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total mobilization costs for contingencies

UP Mobilization, Engineering and Contingencies

II. Engineering

	$2006	Allocation by asset	Contingencies	Total Engineering 1/
Road Preparation	$ 15,604,502,673	$ 1,560,450,267	$ 156,045,027	$ 1,716,495,294
Track	$ 26,385,973,143	$ 2,638,597,314	$ 263,859,731	$ 2,902,457,046
Ballast and Sub-ballast	$ 4,675,338,250	$ 467,533,825	$ 46,753,382	$ 514,287,207
Tunnels	$ 1,997,923,500	$ 199,792,350	$ 19,979,235	$ 219,771,585
Bridges and Culverts	$ 6,486,274,176	$ 648,627,418	$ 64,862,742	$ 713,490,159
Signals & Communications	$ 4,744,215,389	$ 474,421,539	$ 47,442,154	$ 521,863,693
Buildings & Facilities	$ 178,593,296	$ 17,859,330	$ 1,785,933	$ 19,645,263
Public Improvements	$ 978,039,939	$ 97,803,994	$ 9,780,399	$ 107,584,393
Total	$ 61,050,860,365			
Engineering Factor	10 00%			
Total Engineering	**$ 6,105,086,037**	**$ 6,105,086,037**	**$ 610,508,604**	**$ 6,715,594,640**

1/ Engineering includes 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and 10% of the total engineering costs for contingencies

UP Mobilization, Engineering and Contingencies

III. Contingencies

	$2006	Total Contingencies 1/
Road Preparation	$ 15,604,502,673	$ 1,560,450,267
Track	$ 26,385,973,143	$ 2,638,597,314
Ballast and Sub-ballast	$ 4,675,338,250	$ 467,533,825
Tunnels	$ 1,997,923,500	$ 199,792,350
Bridges and Culverts	$ 6,486,274,176	$ 648,627,418
Signals & Communications	$ 4,744,215,389	$ 474,421,539
Buildings & Facilities	$ 178,593,296	$ 17,859,330
Public Improvements	$ 978,039,939	$ 97,803,994
Mobilization	$ 2,136,780,113	$ 213,678,011
Engineering	$ 6,105,086,037	$ 610,508,604
Total	$ 69,292,726,515	
Contingency Factor	10%	
Total Contingency	**$ 6,929,272,651**	**$ 6,929,272,651**
Mobilization,Engineering & Contingencies	**$ 15,171,138,801**	

1/ Contingencies include 10% of the cost of road preparation, track, tunnels, bridges and culverts, signals and communications, buildings and facilities, public improvements, and mobilization and engineering costs

UP Mobilization, Engineering and Contingencies

IV. Allocation by Asset

Allocation of M,E&C		Mobil. & Conting	Engineering
Road Preparation	$ 3,877,718,914	$ 2,161,223,620	$ 1,716,495,294
Track	$ 6,556,914,326	$ 3,654,457,280	$ 2,902,457,046
Ballast and Sub-ballast	$ 1,161,821,555	$ 647,534,348	$ 514,287,207
Tunnels	$ 496,483,990	$ 276,712,405	$ 219,771,585
Bridges and Culverts	$ 1,611,839,133	$ 898,348,973	$ 713,490,159
Signals & Communications	$ 1,178,937,524	$ 657,073,831	$ 521,863,693
Buildings & Facilities	$ 44,380,434	$ 24,735,172	$ 19,645,263
Public Improvements	$ 243,042,925	$ 135,458,531	$ 107,584,393
Total M,E&C	**$ 15,171,138,801**	**$ 8,455,544,161**	**$ 6,715,594,640**

UP Replacement Cost of Locomotive Units Owned by Class and Traction Type
2006

Locomotive Units		Horsepower Capacity	Standard unit HP	Replacement Cost Units	Replacement Unit Cost	Replacement Cost
Diesel-freight		0	0	-		$ -
Diesel-multiple purpose - DC Traction		-	4,400	-	$ 1,725,154	$ -
Diesel-multiple purpose - AC Traction		15,837,417	4,400	3,599	$ 1,820,256	$ 6,551,853,679
Diesel-switching		0	0	484	$ 724,490	$ 350,653,239
Auxiliary units				105	$ 724,490	$ 76,071,467
Total Locomotive Replacement Cost				4,188		$ 6,978,578,386

Replacement Cost Information Licensed to BNSF Railway by RailSolutions, Inc

Replacement Cost of UP Freight Cars
End of Year 2006

Car Type	UP owned	UP total	UP owned %	UP Total Capacity (tons)	UP owned capacity (tons)	Replacement Cars	Replacement Cost	Total
36-Plain box car - 40'	-	-	0%	-	0	-	$ 83,000	$ -
37-Plain box cars - 50' and longer	51	51	100%	4 321	4,321	42	$ 83,000	$ 3,486,000
38-Equipped box cars	9,300	14,342	65%	1,190 576	772,023	7,353	$ 83,000	$ 610,299,000
39-plain gondola cars	939	4,809	20%	564,303	110,185	1,002	$ 64,000	$ 64,128,000
40-Equipped gondola cars	7,513	10,075	75%	995,488	742 343	6,749	$ 70,000	$ 472,430,000
41-Covered hopper cars	15,920	38,785	41%	4,095,414	1,681 036	15,283	$ 72,500	$ 1,108,017,500
42-Open top hopper cars - general	12,186	15,583	78%	1 816,416	1,420,448	12,914	$ 75,000	$ 968,550,000
43 Open top hopper cars -special	921	3,429	27%	376,289	101,068	919	$ 75,000	$ 68,925,000
44-Refrigerator cars - mechanical	912	5,945	15%	463 063	71 037	677	$ 83 000	$ 56 191 000
45-Refrigerator cars - nonmechanical	2,924	4,004	73%	307 122	224,282	2,137	$ 83,000	$ 177,371,000
46-Flat Cars - TOFC/COFC *	108	505	21%	N/A	N/A	108	$ 175 000	$ 18,900 000
47-Flat cars - multilevel *	1 119	2,174	51%	N/A	N/A	1 119	$ 62 000	$ 69,378 000
48-Flat cars - general service	48	51	94%	4 106	3,864	36	$ 72 000	$ 2,592 000
49-Flat cars - other	2 538	4,734	54%	481,866	258 350	2,349	$ 72 000	$ 169 128 000
50-Tank cars - under 22000 gal	-	11	0%	1 116	0	-	$ 82,000	$ -
51-Tank cars - 22000 gal and over	-	210	0%	20,887	0	-	$ 82 000	$ -
52-All other freight cars	4	17	24%	1 672	393	4	$ 83,000	$ 332,000
Total Replacement Cost of Freight Cars	**54,483**	**104,725**		**10,322,659**		**50,692**		**$ 3,789,727,500**

* Replacement cars are based on R-1 car counts

AAR Car Code	Description	Capacity	2006 Avg Car Cost
A__ & B__	Boxcar, General Service	105	$ 83,000
C111, C112 C311 C312	Covered Hopper Small Cu Cap	110	$ 63,000
C113 C114 C313 C314	Covered Hopper General Service	110	$ 67,000
C214	Covered Hopper Special, Plastics/Resins	110	$ 80,000
C611 C612, C613 C614	Covered Hopper, Pressure Differential	110	$ 80,000
E__, G4__, G5__, G6__, G7__	Gondola, Mill and Coil Steel	110	$ 70,000
H__, K__	Open Hopper, Coal	110	$ 75,000
J301, J302 J303, J311, J312	Gondola High Side, Coal	110	$ 64,000
F383, F483	Flatcar Ctr Beam and Bulkhead	110	$ 72,000
S__	IM Container Car Double Stack	3-car art	$ 175,000
T103 through T108	Tank Car, General Service	100	$ 80 000
T389 and >	Tank Car High Pressure	100	$ 90,000
T054, T055	Tank Car Acids	100	$ 76,000
V__	Autoracks	bi- or tri-	$ 62,000